4th Edition

OPTIONS AS A STRATEGIC INVESTMENT

Lawrence G. McMillan

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Preface

When the listed option market originated in April 1973, a new world of investment strategies was opened to the investing public. The standardization of option terms and the formation of a liquid secondary market created new investment vehicles that, adapted properly, can enhance almost every investment philosophy, from the conservative to the speculative. This book is about those option strategies – which ones work in which situations and why they work.

Some of these strategies are traditionally considered to be complex, but with the proper knowledge of their underlying principles, most investors can understand them. While this book contains all the basic definitions concerning options, little time or space is spent on the most elementary definitions. For example, the reader should be familiar with what a call option is, what the CBOE is, and how to find and read option quotes in a newspaper. In essence, everything is contained here for the novice to build on, but the bulk of the discussion is above the beginner level. The reader should also be somewhat familiar with technical analysis, understanding at least the terms *support* and *resistance.*

Certain strategies can be, and have been, the topic of whole books – call buying, for example. While some of the strategies discussed in this book receive a more thorough treatment than others, this is by no means a book about only one or two strategies. Current literature on stock options generally does not treat covered call writing in a great deal of detail. But because it is one of the most widely used option strategies by the investing public, call writing is the subject of one of the most in-depth discussions presented here. The material presented herein on call and put buying is not particularly lengthy, although much of it is of an advanced nature – especially the parts regarding buying volatility – and should be useful even to sophisticated traders. In discussing each strategy, particular emphasis is placed on showing why one would want to implement the strategy in the first place and on demonstrat-

are made for using the computer as a tool in follow-up action, including an example printout of an advanced follow-up analysis.

THIRD EDITION

There were originally six new chapters in the third edition. There were new chapters on LEAPS, CAPS, and PERCS, since they were new option or option-related products at that time.

LEAPS are merely long-term options. However, as such, they require a little different viewpoint than regular short-term options. For example, short-term interest rates have a much more profound influence on a longer-term option than on a short-term one. Strategies are presented for using LEAPS as a substitute for stock ownership, as well as for using LEAPS in standard strategies.

PERCS are actually a type of preferred stock, with a redemption feature built in. They also pay significantly larger dividends than the ordinary common stock. The redemption feature makes a PERCS exactly like a covered call option write. As such, several strategies apply to PERCS that would also apply to covered writers. Moreover, suggestions are given for hedging PERCS. Subsequently, the PERCS chapter was enveloped into a larger chapter in the fourth edition.

The chapters on futures and other non-equity options that were written for the second edition were deleted and replaced by two entirely new chapters on futures options. Strategists should familiarize themselves with futures options, for many profit opportunities exist in this area. Thus, even though futures trading may be unfamiliar to many customers and brokers who are equity traders, it behooves the serious strategist to acquire a knowledge of futures options. A chapter on futures concentrates on definitions, pricing, and strategies that are unique to futures options; another chapter centers on the use of futures options in spreading strategies. These spreading strategies are different from the ones described in the first part of the book, although the calendar spread looks similar, but is really not. Futures traders and strategists spend a great deal of time looking at futures spreads, and the option strategies presented in this chapter are designed to help make that type of trading more profitable.

A new chapter dealing with advanced mathematical concepts was added near the end of the book. As option trading matured and the computer became more of an integral way of life in monitoring and evaluating positions, more advanced techniques were used to monitor risk. This chapter describes the six major measures of risk of an option position or portfolio. The application of these measures to initialize positions that are doubly or triply neutral is discussed. Moreover, the use of the computer to predict the results and "shape" of a position at points in the future is described.

There were substantial revisions to the chapters on index options as well. Part of the revisions are due to the fact that these were relatively new products at the time of the writing of the second edition; as a result, many changes were made to the products – delisting of some index options and introduction of others. Also, after the crash of 1987, the use of index products changed somewhat (with introduction of circuit breakers, for example).

FOURTH EDITION

Once again, in the ever-changing world of options and derivatives, some new important products have been introduced and some new concepts in trading have come to the forefront. Meanwhile, others have been delisted or fallen out of favor. There are five new chapters in the fourth edition, four of which deal with the most important approach to option trading today – volatility trading.

The chapter on CAPS was deleted, since CAPS were delisted by the option exchanges. Moreover, the chapter on PERCS was incorporated into a much larger and more comprehensive chapter on another relatively new trading vehicle – structured products. Structured products encompass a fairly wide range of securities – many of which are listed on the major stock exchanges. These versatile products allow for many attractive, derivative-based applications – including index funds that have limited downside risk, for example. Many astute investors buy structured products for their retirements accounts.

Volatility trading has become one of the most sophisticated approaches to option trading. The four new chapters actually comprise a new Part 6 – Measuring And Trading Volatility. This new part of the book goes in-depth into why one should trade volatility (it's easier to predict volatility than it is to predict stock prices), how volatility affects common option strategies – sometimes in ways that are not initially obvious to the average option trader, how stock prices are distributed (which is one of the reasons why volatility trading "works"), and how to construct and monitor a volatility trade. A number of relatively new techniques regarding measuring and predicting volatility are presented in these chapters. Personally, I think that volatility buying of stock options is the most useful strategy, in general, for traders of all levels – from beginners through experts. If constructed properly, the strategy not only has a high probability of success, but it also requires only a modest amount of work to monitor the position after it has been established. This means that a volatility buyer can have a "life" outside of watching a screen with dancing numbers on it all day.

Moreover, most of the previous chapters were expanded to include the latest techniques and developments. For example, in Chapter 1 (Definitions), the entire area of option symbology has been expanded, because of the wild movements of

stocks in the past few years. Also, the margin rules were changed in 2000, and those changes are noted throughout the book.

Those chapters dealing with the sale of options – particularly naked options – have been expanded to include more discussion of the way that stocks behave and how that presents problems and opportunities for the option writer. For example, in the chapter on Reverse Spreads, the reverse calendar spread is described in detail because – in a high-volatility environment – the strategy becomes much more viable.

Another strategy that receives expanded treatment is the "collar" – the purchase of a put and simultaneous sale of a call against an underlying instrument. In fact, a similar strategy can be used – with a slight adjustment – by the outright buyer of an option (see the chapter on Spreads Combining Puts and Calls).

I am certain that many readers of this book expect to learn what the "best" option strategy is. While there is a chapter discussing this subject, there is no definitively "best" strategy. The optimum strategy for one investor may not be best for another. Option professionals who have the time to monitor positions closely may be able to utilize an array of strategies that could not possibly be operated diligently by a public customer employed in another full-time occupation. Moreover, one's particular investment philosophy must play an important part in determining which strategy is best for him. Those willing to accept little or no risk other than that of owning stock may prefer covered call writing. More speculative strategists may feel that low-cost, high-profit-potential situations suit them best.

Every investor must read the Options Clearing Corporation Prospectus before trading in listed options. Options may not be suitable for every investor. There are risks involved in any investment, and certain option strategies may involve large risks. The reader must determine whether his or her financial situation and investment objectives are compatible with the strategies described. The only way an investor can reasonably make a decision on his or her own to trade options is to attempt to acquire a knowledge of the subject.

Several years ago, I wrote that "the option market shows every sign of becoming a stronger force in the investment world. Those who understand it will be able to benefit the most." Nothing has happened in the interim to change the truth of that statement, and in fact, it could probably be even more forcefully stated today. For example, the Federal Reserve Board now often makes decisions with an eye to how derivatives will affect the markets. That shows just how important derivatives have become. The purpose of this book is to provide the reader with that understanding of options.

I would like to express my appreciation to several people who helped make this book possible: to Ron Dilks and Howard Whitman, who brought me into the bro-

kerage business; to Art Kaufman, whose broad experience in options helped to crystallize many of these strategies; to Peter Kopple for his help in reviewing the chapter on arbitrage; to Shelley Kaufman for his help on the third and fourth editions in designing the graphs and in the massive task of proofreading and editing; to Ben Russell and Fred Dahl for their suggestions on format and layout of the initial book; and to Jim Dalton (then president of the CBOE) for recommending a little-known option strategist when the New York Institute of Finance asked him, in 1977, if he had any suggestions for an author for a new book on options. Special thanks go to Bruce Nemirow for his invaluable assistance, especially for reading and critiquing the original manuscript. Most of all, I am grateful to my wife, Janet, who typed the original manuscript, and to Karen and Glenn, our children, all of whom graciously withstood the countless hours of interrupted family life that were necessary in order to complete this work.

LAWRENCE G. MCMILLAN

PART I

Basic Properties of Stock Options

INTRODUCTION

Each chapter in this book presents information in a logically sequential fashion. Many chapters build on the information presented in preceding chapters. One should therefore be able to proceed from beginning to end without constantly referring to the glossary or index. However, the reader who is using the text as a reference – perhaps scanning one of the later chapters – many find that terms are being encountered that have been defined in an earlier chapter. In this case, the extensive glossary at the back of the book should prove useful. The index may provide aid as well, since some subjects are described, in varying levels of complexity, in more than one place in the book. For example, call buying is discussed initially in Chapter 3; and mathematical applications, as they apply to call purchases, are described in Chapter 28. The latter chapters address more complex topics than do the early chapters.

CHAPTER 1

Definitions

The successful implementation of various investment strategies necessitates a sound working knowledge of the fundamentals of options and option trading. The option strategist must be familiar with a wide range of the basic aspects of stock options – how the price of an option behaves under certain conditions or how the markets function. A thorough understanding of the rudiments and of the strategies helps the investor who is not familiar with options to decide not only whether a strategy seems desirable, but also – and more important – *whether it is suitable.* Determining suitability is nothing new to stock market investors, for stocks themselves are not suitable for every investor. For example, if the investor's primary objectives are income and safety of principal, then bonds, rather than stocks, would be more suitable. The need to assess the suitability of options is especially important: Option buyers can lose their entire investment in a short time, and uncovered option writers may be subjected to large financial risks. Despite follow-up methods designed to limit risk, the individual investor must decide whether option trading is suitable for his or her financial situation and investment objective.

ELEMENTARY DEFINITIONS

A stock option is the right to buy or sell a particular stock at a certain price for a limited period of time. The stock in question is called the underlying security. A call option gives the owner (or holder) the right to buy the underlying security, while a put option gives the holder the right to sell the underlying security. The price at which the stock may be bought or sold is the exercise price, also called the striking price. (In the listed options market, "exercise price" and "striking price" are synonymous.) A stock option affords this right to buy or sell for only a limited period of time;

thus, each option has an expiration date. Throughout the book, the term "options" is always understood to mean listed options, that is, options traded on national option exchanges where a secondary market exists. Unless specifically mentioned, over-the-counter options are not included in any discussion.

DESCRIBING OPTIONS

Four specifications uniquely describe any option contract:

1. the type (put or call),
2. the underlying stock name,
3. the expiration date, and
4. the striking price.

As an example, an option referred to as an "XYZ July 50 call" is an option to buy (a call) 100 shares (normally) of the underlying XYZ stock for $50 per share. The option expires in July. The price of a listed option is quoted on a per-share basis, regardless of how many shares of stock can be bought with the option. Thus, if the price of the XYZ July 50 call is quoted at $5, buying the option would ordinarily cost $500 ($5 × 100 shares), plus commissions.

THE VALUE OF OPTIONS

An option is a "wasting" asset; that is, it has only an initial value that declines (or "wastes" away) as time passes. It may even expire worthless, or the holder may have to exercise it in order to recover some value before expiration. Of course, the holder may sell the option in the listed option market before expiration.

An option is also a security by itself, but it is a derivative security. The option is irrevocably linked to the underlying stock; its price fluctuates as the price of the underlying stock rises or falls. Splits and stock dividends in the underlying stock affect the terms of listed options, although cash dividends do not. The holder of a call does not receive any cash dividends paid by the underlying stock.

STANDARDIZATION

The listed option exchanges have standardized the terms of option contracts. The terms of an option constitute the collective name that includes all of the four descriptive specifications. While the type (put or call) and the underlying stock are self-evident and essentially standardized, the striking price and expiration date require more explanation.

Striking Price. Striking prices are generally spaced 5 points apart for stocks, although for more expensive stocks, the striking prices may be 10 points apart. A $35 stock might, for example, have options with striking prices, or "strikes," of 30, 35, and 40, while a $255 stock might have one at 250 and one at 260. Moreover, some stocks have striking prices that are 2½ points apart – generally those selling for less than $35 per share. That is, a $17 stock might have strikes at 15, 17½, and 20.

These striking price guidelines are not ironclad, however. Exchange officials may alter the intervals to improve depth and liquidity, perhaps spacing the strikes 5 points apart on a nonvolatile stock even if it is selling for more than $100. For example, if a $155 stock were very active, and possibly not volatile, then there might well be a strike at 155, in addition to those at 150 and 160.

Expiration Dates. Options have expiration dates in one of three fixed cycles:

1. the January/April/July/October cycle,
2. the February/May/August/November cycle, or
3. the March/June/September/December cycle.

In addition, the two nearest months have listed options as well. However, at any given time, the longest-term expiration dates are normally no farther away than 9 months. Longer-term options, called LEAPS, are available on some stocks (see Chapter 25). Hence, in any cycle, options may expire in 3 of the 4 major months (series) plus the near-term months. For example, on February 1 of any year, XYZ options may expire in February, March, April, July, and October – not in January. The February option (the closest series) is the *short-* or *near-term* option; and the October, the *far-* or *long-term* option. If there were LEAPS options on this stock, they would expire in January of the following year and in January of the year after that.

The exact date of expiration is fixed within each month. The last trading day for an option is the third Friday in the expiration month. Although the option actually does not expire until the following day (the Saturday following), a public customer must invoke the right to buy or sell stock by notifying his broker by 5:30 P.M., New York time, on the last day of trading.

THE OPTION ITSELF: OTHER DEFINITIONS

Classes and Series. A class of options refers to all put and call contracts on the same underlying security. For instance, all IBM options – all the puts and calls at various strikes and expiration months – form one class. A series, a subset of a class,

consists of all contracts of the same class (IBM, for example) having the same expiration date and striking price.

Opening and Closing Transactions. An *opening transaction* is the initial transaction, either a buy or a sell. For example, an opening buy transaction creates or increases a long position in the customer's account. A *closing transaction* reduces the customer's position. Opening buys are often followed by closing sales; correspondingly, opening sells often precede closing buy trades.

Open Interest. The option exchanges keep track of the number of opening and closing transactions in each option series. This is called the open interest. Each opening transaction adds to the open interest and each closing transaction decreases the open interest. The open interest is expressed in number of option contracts, so that one order to buy 5 calls opening would increase the open interest by 5. Note that the open interest does not differentiate between buyers and sellers – there is no way to tell if there is a preponderance of either one. While the magnitude of the open interest is not an extremely important piece of data for the investor, it is useful in determining the liquidity of the option in question. If there is a large open interest, then there should be little problem in making fairly large trades. However, if the open interest is small – only a few hundred contracts outstanding – then there might not be a reasonable secondary market in that option series.

The Holder and Writer. Anyone who buys an option as the initial transaction – that is, buys opening – is called the holder. On the other hand, the investor who sells an option as the initial transaction – an opening sale – is called the writer of the option. Commonly, the writer (or seller) of an option is referred to as being short the option contract. The term "writer" dates back to the over-the-counter days, when a direct link existed between buyers and sellers of options; at that time, the seller was the writer of a new contract to buy stock. In the listed option market, however, the issuer of all options is the Options Clearing Corporation, and contracts are standardized. This important difference makes it possible to break the direct link between the buyer and seller, paving the way for the formation of the secondary markets that now exist.

Exercise and Assignment. An option owner (or holder) who invokes the right to buy or sell is said to exercise the option. Call option holders exercise to buy stock; put holders exercise to sell. The holder of most stock options may exercise the option at any time after taking possession of it, up until 8:00 P.M. on

the last trading day; the holder does not have to wait until the expiration date itself before exercising. (*Note:* Some options, called "European" exercise options, can be exercised only *on* their expiration date and not before – but they are generally not stock options.) These exercise notices are irrevocable; once generated, they cannot be recalled. In practical terms, they are processed only once a day, after the market closes. Whenever a holder exercises an option, somewhere a writer is assigned the obligation to fulfill the terms of the option contract: Thus, if a call holder exercises the right to buy, a call writer is assigned the obligation to sell; conversely, if a put holder exercises the right to sell, a put writer is assigned the obligation to buy. A more detailed description of the exercise and assignment of call options follows later in this chapter; put option exercise and assignment are discussed later in the book.

RELATIONSHIP OF THE OPTION PRICE AND STOCK PRICE

In- and Out-of-the-Money. Certain terms describe the relationship between the stock price and the option's striking price. A call option is said to be out-of-the-money if the stock is selling below the striking price of the option. A call option is in-the-money if the stock price is above the striking price of the option. (Put options work in a converse manner, which is described later.)

Example: XYZ stock is trading at $47 per share. The XYZ July 50 call option is out-of-the-money, just like the XYZ October 50 call and the XYZ July 60 call. However, the XYZ July 45 call, XYZ October 40, and XYZ January 35 are in-the-money.

The *intrinsic value* of an in-the-money call is the amount by which the stock price exceeds the striking price. If the call is out-of-the-money, its intrinsic value is zero. The price that an option sells for is commonly referred to as the premium. The premium is distinctly different from the time value premium (called time premium, for short), which is the amount by which the option premium itself exceeds its intrinsic value. The time value premium is quickly computed by the following formula for an in-the-money call option:

Call time value premium = Call option price + Striking price – Stock price

Example: XYZ is trading at 48, and XYZ July 45 call is at 4. The premium – the total price – of the option is 4. With XYZ at 48 and the striking price of the option at 45, the in-the-money amount (or intrinsic value) is 3 points (48 – 45), and the time value is 1 (4 – 3).

If the call is out-of-the-money, then the premium and the time value premium are the same.

Example: With XYZ at 48 and an XYZ July 50 call selling at 2, both the premium and the time value premium of the call are 2 points. The call has no intrinsic value by itself with the stock price below the striking price.

An option normally has the largest amount of time value premium when the stock price is equal to the striking price. As an option becomes deeply in- or out-of-the-money, the time value premium shrinks substantially. Table 1-1 illustrates this effect. Note that the time value premium increases as the stock nears the striking price (50) and then decreases as it draws away from 50.

Parity. An option is said to be trading *at parity* with the underlying security if it is trading for its intrinsic value. Thus, if XYZ is 48 and the XYZ July 45 call is selling for 3, the call is *at parity.* A common practice of particular interest to option writers (as shall be seen later) is to refer to the price of an option by relating how close it is to parity with the common stock. Thus, the XYZ July 45 call is said to be a half-point over parity in any of the cases shown in Table 1-2.

TABLE 1-1.
Changes in time value premium.

XYZ Stock Price	XYZ Jul 50 Call Price	Intrinsic Value	Time Value Premium
40	½	0	½
43	1	0	1
35	2	0	2
47	4	0	3
→**50**	***5***	***0***	***5***
53	7	3	4
55	8	5	3
57	9	7	2
60	10½	10	½
70	19½	20	–½[a]

[a]Simplistically, a deeply in-the-money call may actually trade at a discount from intrinsic value, because call buyers are more interested in less expensive calls that might return better percentage profits on an upward move in the stock. This phenomenon is discussed in more detail when arbitrage techniques are examined.

TABLE 1-2.
Comparison of XYZ stock and call prices.

Striking Price	+	XYZ July 45 Call Price	−	XYZ Stock Price	=	Over Parity
(45	+	1	−	45½)	=	½
(45	+	2½	−	47)	=	½
(45	+	5½	−	50)	=	½
(45	+	15½	−	60)	=	½

FACTORS INFLUENCING THE PRICE OF AN OPTION

An option's price is the result of properties of both the underlying stock and the terms of the option. The major quantifiable factors influencing the price of an option are the:

1. price of the underlying stock,
2. striking price of the option itself,
3. time remaining until expiration of the option,
4. volatility of the underlying stock,
5. current risk-free interest rate (such as for 90-day Treasury bills), and
6. dividend rate of the underlying stock.

The first four items are the major determinants of an option's price, while the latter two are generally less important, although the dividend rate can be influential in the case of high-yield stock.

THE FOUR MAJOR DETERMINANTS

Probably the most important influence on the option's price is the stock price, because if the stock price is far above or far below the striking price, the other factors have little influence. Its dominance is obvious on the day that an option expires. On that day, only the stock price and the striking price of the option determine the option's value; the other four factors have no bearing at all. At this time, an option is worth only its intrinsic value.

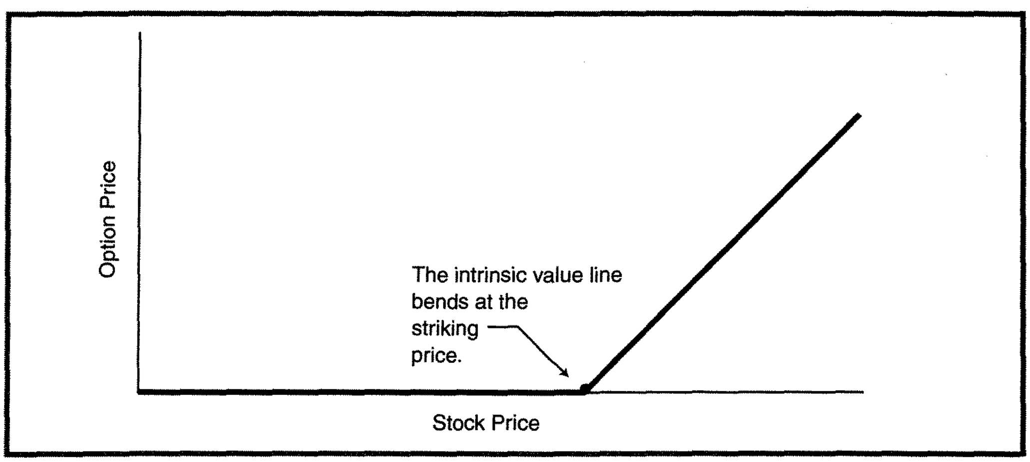
Example: On the expiration day in July, with no time remaining, an XYZ July 50 call has the value shown in Table 1-3; each value depends on the stock price at the time.

TABLE 1-3.
XYZ option's values on the expiration day.

XYZ Stock Price	XYZ July 50 Call (Intrinsic) Value at Expiration
40	0
45	0
48	0
50	0
52	2
55	5
60	10

The Call Option Price Curve. The call option price curve is a curve that plots the prices of an option against various stock prices. Figure 1-1 shows the axes needed to graph such a curve. The vertical axis is called Option Price. The horizontal axis is for Stock Price. This figure is a graph of the intrinsic value. When the option is either out-of-the-money or equal to the stock price, the intrinsic value is zero. Once the stock price passes the striking price, it reflects the increase of intrinsic value as the stock price goes up. Since a call is usually worth at least its intrinsic value at any time, the graph thus represents the minimum price that a call may be worth.

FIGURE 1-1.
The value of an option at expiration, its intrinsic value.



When a call has time remaining to its expiration date, its total price consists of its intrinsic value plus its time value premium. The resultant call option price curve takes the form of an inverted arch that stretches along the stock price axis. If one plots the data from Table 1-4 on the grid supplied in Figure 1-2, the curve assumes two characteristics:

1. The time value premium (the shaded area) is greatest when the stock price and the striking price are the same.
2. When the stock price is far above or far below the striking price (near the ends of the curve), the option sells for nearly its intrinsic value. As a result, the curve nearly touches the intrinsic value line at either end. [Figure 1-2 thus shows both the intrinsic value and the option price curve.]

This curve, however, shows only how one might expect the XYZ July 50 call prices to behave with 6 months remaining until expiration. As the time to expiration grows shorter, the arched line drops lower and lower, until, on the final day in the life of the option, it merges completely with the intrinsic value line. In other words, the call is worth only its intrinsic value at expiration. Examine Figure 1-3, which depicts three separate XYZ calls. At any given stock price (a fixed point on the stock price scale), the longest-term call sells for the highest price and the nearest-term call sells for the lowest price. At the striking price, the actual differences in the three option prices are the greatest. Near either end of the scale, the three curves are much closer together, indicating that the actual price differences from one option to another are small. For a given stock price, therefore, option prices decrease as the expiration date approaches.

TABLE 1-4.
The prices of a hypothetical July 50 call with 6 months of time remaining, plotted in Figure 1-2.

XYZ Stock Price (Horizontal Axis)	XYZ July 50 Call Price (Vertical Axis)	Intrinsic Value	Time Value Premium (Shading)
40	1	0	1
45	2	0	2
48	3	0	3
→**50**	**4**	**0**	**4**
52	5	2	3
55	6½	5	1½
60	11	10	1

Example: On January 1st, XYZ is selling at 48. An XYZ July 50 call will sell for more than an April 50 call, which in turn will sell for more than a January 50 call.

FIGURE 1-2.
Six-month July call option (see Table 1-4).

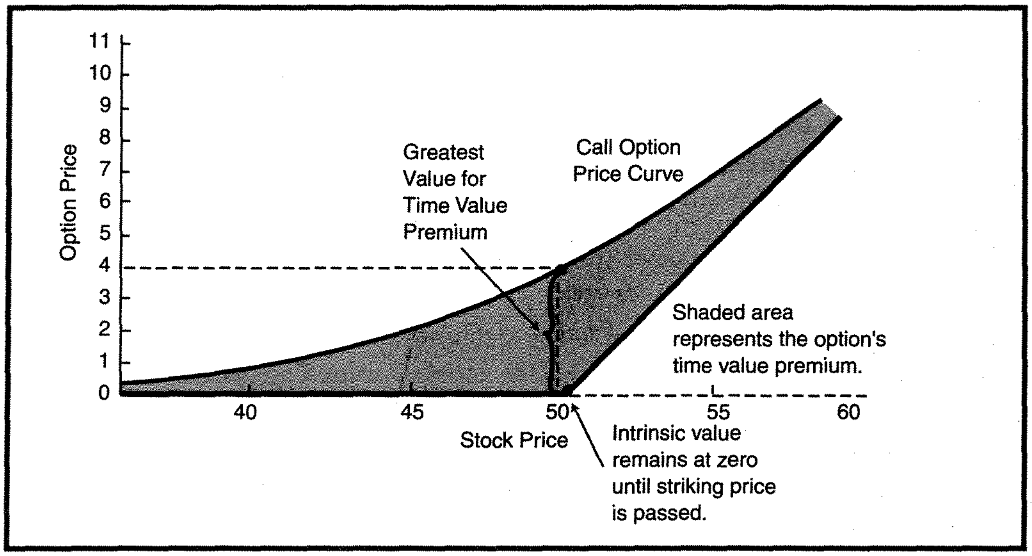
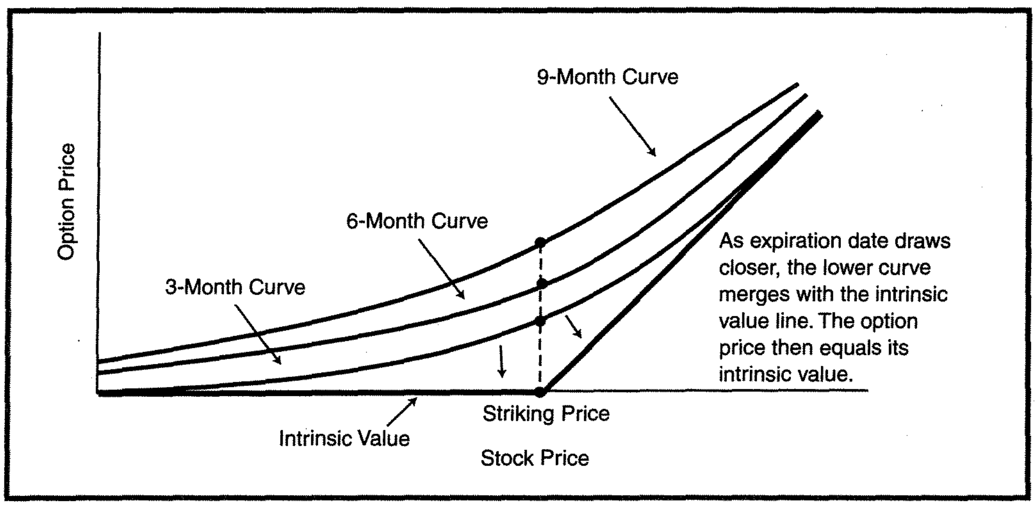


FIGURE 1-3.
Price Curves for the 3-, 6-, and 9-month call options.

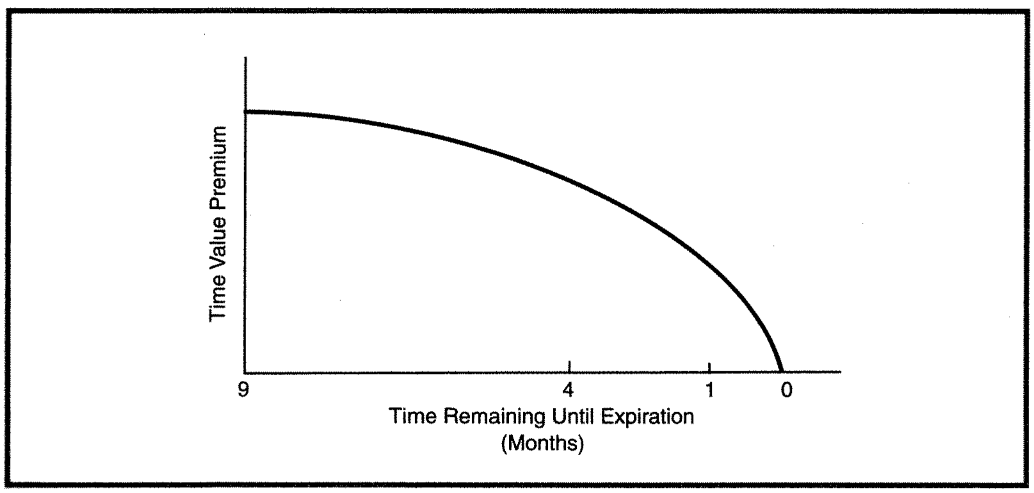


This statement is true no matter what the stock price is. The only reservation is that with the stock deeply in- or out-of-the-money, the actual difference between the January, April, and July calls will be smaller than with XYZ stock selling at the striking price of 50.

Time Value Premium Decay. In Figure 1-3, notice that the price of the 9-month call is not three times that of the 3-month call. Note next that the curve in Figure 1-4 for the decay of time value premium is not straight; that is, *the rate of decay of an option is not linear.* An option's time value premium decays much more rapidly in the last few weeks of its life (that is, in the weeks immediately preceding expiration) than it does in the first few weeks of its existence. The rate of decay is actually related to the square root of the time remaining. Thus, a 3-month option decays (loses time value premium) at twice the rate of a 9-month option, since the square root of 9 is 3. Similarly, a 2-month option decays at twice the rate of a 4-month option ($\sqrt{4} = 2$).

This graphic simplification should not lead one to believe that a 9-month option necessarily sells for twice the price of a 3-month option, because the other factors also influence the actual price relationship between the two calls. Of those other factors, the *volatility* of the underlying stock is particularly influential. *More volatile underlying stocks have higher option prices.* This relationship is logical, because if a

FIGURE 1-4.
Time value premium decay, assuming the stock price remains constant.



stock has the ability to move a relatively large distance upward, buyers of the calls are willing to pay higher prices for the calls – and sellers demand them as well. For example, if AT&T and Xerox sell for the same price (as they have been known to do), the Xerox calls would be more highly priced than the AT&T calls because Xerox is a more volatile stock than AT&T.

The interplay of the four major variables – stock price, striking price, time, and volatility – can be quite complex. While a rising stock price (for example) is directing the price of a call upward, decreasing time may be simultaneously driving the price in the opposite direction. Thus, the purchaser of an out-of-the-money call may wind up with a loss even after a rise in price by the underlying stock, because time has eroded the call value.

THE TWO MINOR DETERMINANTS

The Risk-Free Interest Rate. This rate is generally construed as the current rate of 90-day Treasury bills. Higher interest rates imply slightly higher option premiums, while lower rates imply lower premiums. Although members of the financial community disagree as to the extent that interest rates actually affect option price, they remain a factor in most mathematical models used for pricing options. (These models are covered much later in this book.)

The Cash Dividend Rate of the Underlying Stock. Though not classified as a major determinant in option prices, this rate can be especially important to the writer (seller) of an option. If the underlying stock pays no dividends at all, then a call option's worth is strictly a function of the other five items. *Dividends, however, tend to lower call option premiums: The larger the dividend of the underlying common stock, the lower the price of its call options.* One of the most influential factors in keeping option premiums low on high-yielding stock is the yield itself.

Example: XYZ is a relatively low-priced stock with low volatility selling for $25 per share. It pays a large annual dividend of $2 per share in four quarterly payments of $.50 each. What is a fair price of an XYZ call with striking price 25?

A prospective buyer of XYZ options is determined to figure out a fair price. In six months XYZ will pay $1 per share in dividends, and the stock price will thus be reduced by $1 per share when it goes ex-dividend over that time period. In that case, if XYZ's price remains unchanged except for the ex-dividend reductions, it will then be $24. Moreover, since XYZ is a nonvolatile stock, it may not readily climb back to 25 after the ex-dividend reductions. Therefore, the call buyer makes a low bid – even

for a 6-month call – because the underlying stock's price will be reduced by the ex-dividend reduction, and the call holder does not receive the cash dividends.

This particular call buyer calculated the value of the XYZ July 25 call in terms of what it was worth with the stock discounted to 24 – not at 25. He knew for certain that the stock was going to lose 1 point of value over the next 6 months, provided the dividend rate of XYZ stock did not change. In actual practice, option buyers tend to discount the upcoming dividends of the stock when they bid for the calls. However, not all dividends are discounted fully; usually the nearest dividend is discounted more heavily than are dividends to be paid at a later date. The less-volatile stocks with the higher dividend payout rates have lower call prices than volatile stocks with low payouts. In fact, in certain cases, an impending large dividend payment can substantially increase the probability of an exercise of the call in advance of expiration. (This phenomenon is discussed more fully in the following section.) In any case, to one degree or another, dividends exert an important influence on the price of some calls.

OTHER INFLUENCES

These six factors, major and minor, are only the quantifiable influences on the price of an option. In practice, nonquantitative market dynamics – investor sentiment – can play various roles as well. In a bullish market, call premiums often expand because of increased demand. In bearish markets, call premiums may shrink due to increased supply or diminished demand. These influences, however, are normally short-lived and generally come into play only in dynamic market periods when emotions are running high.

EXERCISE AND ASSIGNMENT: THE MECHANICS

The holder of an option can exercise his right at any time during the life of an option: Call option holders exercise to buy stock, while put option holders exercise to sell stock. In the event that an option is exercised, the writer of an option with the same terms is *assigned an obligation* to fulfill the terms of the option contract.

EXERCISING THE OPTION

The actual mechanics of exercise and assignment are fairly simple, due to the role of the Options Clearing Corporation (OCC). As the issuer of all listed option contracts, it controls all listed option exercises and assignments. Its activities are best explained by an example.

Example: The holder of an XYZ January 45 call option wishes to exercise his right to buy XYZ stock at $45 per share. He instructs his broker to do so. The broker then notifies the administrative section of the brokerage firm that handles such matters. The firm then notifies the OCC that they wish to exercise one contract of the XYZ January 45 call series.

Now the OCC takes over the handling. OCC records indicate which member (brokerage) firms are short or which have written and not yet covered XYZ Jan 45 calls. The OCC selects, at random, a member firm that is short at least one XYZ Jan 45 call, and it notifies the short firm that it has been assigned. That firm must then deliver 100 shares of XYZ at $45 per share to the firm that exercised the option. The assigned firm, in turn, selects one of its customers who is short the XYZ January 45 call. This selection for the assignment may be either:

1. at random,
2. on a first-in/first-out basis, or
3. on any other basis that is fair, equitable, and approved by the appropriate exchange.

The selection of the customer who is short the XYZ January 45 completes the exercise/assignment process. (If one is an option writer, he should obviously determine exactly how his brokerage firm assigns its option contracts.)

HONORING THE ASSIGNMENT

The assigned customer *must* deliver the stock – he has no other choice. It is too late to try buying the option back in the option market. He must, without fail, deliver 100 shares of XYZ stock at $45 per share. The assigned writer does, however, have a choice as to how to fulfill the assignment. If he happens to be already long 100 shares of XYZ in his account, he merely delivers that 100 shares as fulfillment of the assignment notice. Alternatively, he can go into the stock market and buy XYZ at the current market price – presumably something higher than $45 – and then deliver the newly purchased stock as fulfillment. A third alternative is merely to notify his brokerage firm that he wishes to go short XYZ stock and to ask them to deliver the 100 shares of XYZ at 45 out of his short account. At times, borrowing stock to go short may not be possible, so this third alternative is not always available on every stock.

Margin Requirements. If the assigned writer purchases stock to fulfill a contract, reduced margin requirements generally apply to the transaction, so that he would not have to fully margin the purchased stock merely for the purpose of delivery. Generally, the customer only has to pay a day-trade margin of

the difference between the current price of XYZ and the delivery price of $45 per share. If he goes short to honor the assignment, then he has to fully margin the short sale at the current rate for stock sold short on a margin basis.

AFTER EXERCISING THE OPTION

The OCC and the customer exercising the option are not concerned with the actual method in which the delivery is handled by the assigned customer. They want only to ensure that the 100 shares of XYZ at 45 are, in fact, delivered. The holder who exercised the call can keep the stock in his account if he wants to, but he has to margin it fully or pay cash in a cash account. On the other hand, he may want to sell the stock immediately in the open market, presumably at a higher price than 45. If he has an established margin account, he may sell right away without putting out any money. If he exercises in a cash account, however, the stock must be paid for in full – even if it is subsequently sold on the same day. Alternatively, he may use the delivered stock to cover a short sale in his own account if he happens to be short XYZ stock.

COMMISSIONS

Both the buyer of the stock via the exercise and the seller of the stock via the assignment are charged a full stock commission on 100 shares, unless a special agreement exists between the customer and the brokerage firm. Generally, option holders incur higher commission costs through assignment than they do selling the option in the secondary market. *So the public customer who holds an option is better off selling the option in the secondary market than exercising the call.*

Example: XYZ is $55 per share. A public customer owns the XYZ January 45 call option. He realizes that exercising the call, buying XYZ at 45, and then immediately selling it at 55 in the stock market would net a profit of 10 points – or $1,000. However, the combined stock commissions on both the purchase at 45 and the sale at 55 might easily exceed $100. The net gain would actually be only $900.

On the other hand, the XYZ January 45 call is worth (and it would normally sell for) at least 10 points in the listed options market. The commission for selling one call at a price of 10 is roughly $30. The customer therefore decides to sell his XYZ January 45 call in the option market. He receives $1,000 (10 points) for the call and pays only $30 in commissions – for a net of $970. The benefit of his decision is obvious.

Of course, sometimes a customer wants to own XYZ stock at $45 per share, despite the stock commissions. Perhaps the stock is an attractive addition that will

bring greater potential to a portfolio. Or if the customer is already short the XYZ stock, he is going to have to buy 100 shares and pay the commissions sooner or later in any case; so exercising the call at the lower stock price of 45 may be more desirable than buying at the current price of 55.

ANTICIPATING ASSIGNMENT

The writer of a call often prefers to buy the option back in the secondary market, rather than fulfill the obligation via a stock transaction. It should be stressed again that once the writer receives an assignment notice, it is too late to attempt to buy back (cover) the call. The writer must buy *before* assignment, or live up to the terms upon assignment. The writer who is aware of the circumstances that generally cause the holders to exercise can anticipate assignment with a fair amount of certainty. In anticipation of the assignment, the writer can then close the contract in the secondary market. As long as the writer covers the position at any time during a trading day, he cannot be assigned on that option. Assignment notices are determined on open positions as of the *close* of trading each day. The crucial question then becomes, "How can the writer anticipate assignment?" Several circumstances signal assignments:

1. a call that is in-the-money at expiration,
2. an option trading at a discount prior to expiration, or
3. the underlying stock paying a large dividend and about to go ex-dividend.

Automatic Exercise. Assignment is all but certain if the option is in-the-money at expiration. Should the stock close even a half-point above the striking price on the last day of trading, the holder will exercise to take advantage of the half-point rather than let the option expire. Assignment is nearly inevitable even if a call is only a few cents in-the-money at expiration. In fact, even if the call trades in-the-money at any time during the last trading day, assignment may be forthcoming. Even if a holder forgets that he owns an option and fails to exercise, the OCC automatically exercises any call that is ¾-point in-the-money at expiration, unless the individual brokerage firm whose customer is long the call gives specific instructions not to exercise. This *automatic exercise* mechanism ensures that no investor throws away money through carelessness.

Example: XYZ closes at 51 on the third Friday of January (the last day of trading for the January option series). Since options don't expire until Saturday, the next day, the OCC and all brokerage firms have the opportunity to review their records to issue assignments and exercises and to see if any options could have been profitably exer-

cised but were not. If XYZ closed at 51 and a customer who owned a January 45 call option failed to either sell or exercise it, it is automatically exercised. Since it is worth $600, this customer stands to receive a substantial amount of money back, even after stock commissions.

In the case of an XYZ January 50 call option, the automatic exercise procedure is not as clear-cut with the stock at 51. Though the OCC wants to exercise the call automatically, it cannot identify a specific owner. It knows only that one or more XYZ January calls are still open on the long side. When the OCC checks with the brokerage firm, it may find that the firm does not wish to have the XYZ January 50 call exercised automatically, because the customer would lose money on the exercise after incurring stock commissions. Yet the OCC must attempt to automatically exercise any in-the-money calls, because the holder may have overlooked a long position.

When the public customer sells a call in the secondary market on the last day of trading, the buyer on the other side of the trade is very likely a market-maker. Thus, when trading stops, much of the open interest in in-the-money calls held long belongs to market-makers. Since they can profitably exercise even for an eighth of a point, they do so. Hence, the writer may receive an assignment notice even if the stock has been only slightly above the strike price on the last trading day before expiration.

Any writer who wishes to avoid an assignment notice should always buy back (or cover) the option if it appears the stock will be above the strike at expiration. The probabilities of assignment are extremely high if the option expires in-the-money.

Early Exercise Due to Discount. When options are exercised *prior to expiration,* this is called *early,* or *premature, exercise.* The writer can usually expect an early exercise when the call is trading at or below parity. A parity or discount situation in advance of expiration may mean that an early exercise is forthcoming, even if the discount is slight. A writer who does not want to deliver stock should buy back the option prior to expiration if the option is apparently going to trade at a discount to parity. The reason is that arbitrageurs (floor traders or member firm traders who pay only minimal commissions) can take advantage of discount situations. (Arbitrage is discussed in more detail later in the text; it is mentioned here to show why early exercise often occurs in a discount situation.)

Example: XYZ is bid at $50 per share, and an XYZ January 40 call option is offered at a discount price of 9.80. The call is actually "worth" 10 points. The arbitrageur can take advantage of this situation through the following actions, all on the same day:

1. Buy the January 40 call at 9.80.
2. Sell short XYZ common stock at 50.
3. Exercise the call to buy XYZ at 40.

The arbitrageur makes 10 points from the short sale of XYZ (steps 2 and 3), from which he deducts the 9.80 points he paid for the call. Thus, his total gain is 20 cents – the amount of the discount. Since he pays only a minimal commission, this transaction results in a net profit.

Also, if the writer can expect assignment when the option has no time value premium left in it, then conversely the option will usually not be called if time premium is left in it.

Example: Prior to the expiration date, XYZ is trading at $50\frac{1}{2}$, and the January 50 call is trading at 1. The call is not necessarily in imminent danger of being called, since it still has half a point of time premium left.

$$\begin{aligned} \text{Time value premium} &= \text{Call price} + \text{Striking price} - \text{Stock price} \\ &= 1 + 50 - 50\tfrac{1}{2} \\ &= \tfrac{1}{2} \end{aligned}$$

Early Exercise Due to Dividends on the Underlying Stock. Sometimes the market conditions create a discount situation, and sometimes a large dividend gives rise to a discount. Since the stock price is almost invariably reduced by the amount of the dividend, the option price is also most likely reduced after the ex-dividend. Since the holder of a listed option does not receive the dividend, he may decide to sell the option in the secondary market before the ex-date in anticipation of the drop in price. If enough calls are sold because of the impending ex-dividend reduction, the option may come to parity or even to a discount. Once again, the arbitrageurs may move in to take advantage of the situation by buying these calls and exercising them.

If assigned prior to the ex-date, the writer does not receive the dividend for he no longer owns the stock on the ex-date. Furthermore, if he receives an assignment notice on the ex-date, he must deliver the stock with the dividend. It is therefore very important for the writer to watch for discount situations on the day prior to the ex-date.

A word of caution: Do not conclude from this discussion that a call will be exercised for the dividend if the dividend is larger than the remaining time premium. It won't. An example will show why.

Example: XYZ stock, at 50, is going to pay a \$1 dividend with the ex-date set for the next day. An XYZ January 40 call is selling at $10\frac{1}{4}$; it has a quarter-point of time premium. (TVP = $10\frac{1}{4} + 40 - 50 = \frac{1}{4}$). The same type of arbitrage will not work. Suppose that the arbitrageur buys the call at $10\frac{1}{4}$ and exercises it: He now owns the stock for the ex-date, and he plans to sell the stock immediately at the opening on the ex-date, the next day. On the ex-date, XYZ opens at 49, because it goes ex-dividend by \$1. The arbitrageur's transactions thus consist of:

1. Buy the XYZ January 40 call at $10\frac{1}{4}$.
2. Exercise the call the same day to buy XYZ at 40.
3. On the ex-date, sell XYZ at 49 and collect the \$1 dividend.

He makes 9 points on the stock (steps 2 and 3), and he receives a 1-point dividend, for a total cash inflow of 10 points. However, he loses $10\frac{1}{4}$ points paying for the call. The overall transaction is a loser and the arbitrageur would thus not attempt it.

A dividend payment that exceeds the time premium in the call, therefore, does not imply that the writer will be assigned.

More of a possibility, but a much less certain one, is that the arbitrageur may attempt a "risk arbitrage" in such a situation. *Risk arbitrage* is arbitrage in which the arbitrageur runs the risk of a loss in order to try for a profit. The arbitrageur may suspect that the stock will not be discounted the full ex-dividend amount or that the call's time premium will increase after the ex-date. In either case (or both), he might make a profit: If the stock opens down only 60 cents or if the option premium expands by 40 cents, the arbitrageur could profit on the opening. In general, however, arbitrageurs do not like to take risks and therefore avoid this type of situation. So the probability of assignment as the result of a dividend payment on the underlying stock is small, unless the call trades at parity or at a discount.

Of course, the anticipation of an early exercise assumes rational behavior on the part of the call holder. If time premium is left in the call, the holder is always better off financially to sell that call in the secondary market rather than to exercise it. However, the terms of the call contract give a call holder the right to go ahead and exercise it anyway – even if exercise is not the profitable thing to do. In such a case, a writer would receive an assignment notice quite unexpectedly. Financially unsound early exercises do happen, though not often, and an option writer must realize that,

in a very small percentage of cases, he could be assigned under very illogical circumstances.

THE OPTION MARKETS

The trader of stocks does not have to become very familiar with the details of the way the stock market works in order to make money. Stocks don't expire, nor can an investor be pulled out of his investment unexpectedly. However, the option trader is required to do more homework regarding the operation of the option markets. In fact, the option strategist who does not know the details of the working of the option markets will likely find that he or she eventually loses some money due to ignorance.

MARKET-MAKERS

In at least one respect, stock and listed option markets are similar. Stock markets use specialists to do two things: First, they are required to make a market in a stock by buying and selling from their own inventory, when public orders to buy or sell the stock are absent. Second, they keep the public book of orders, consisting of limit orders to buy and sell, as well as stop orders placed by the public. When listed option trading began, the Chicago Board Options Exchange (CBOE) introduced a similar method of trading, the market-maker and the board broker system. The CBOE assigns several market-makers to each optionable stock to provide bids and offers to buy and sell options in the absence of public orders. Market-makers cannot handle public orders; they buy and sell for their own accounts only. A separate person, the board broker, keeps the book of limit orders. The board broker, who cannot do any trading, opens the book for traders to see how many orders to buy and sell are placed nearest to the current market (consisting of the highest bid and lowest offer). (The specialist on the stock exchange keeps a more closed book; he is not required to formally disclose the sizes and prices of the public orders.)

In theory, the CBOE system is more efficient than the stock exchange system. With several market-makers competing to create the market in a particular security, the market should be a more efficient one than a single specialist can provide. Also, the somewhat open book of public orders should provide a more orderly market. In practice, whether the CBOE has a more efficient market is usually a subject for heated discussion. The strategist need not be concerned with the question.

The American Stock Exchange uses specialists for its option trading, but it also has floor traders who function similarly to market-makers. The regional option exchanges use combinations of the two systems; some use market-makers, while others use specialists.

OPTION SYMBOLOGY

It is probably a good idea for an option trader to understand how option symbols are created and used, for it may prove to be useful information. If one has a sophisticated option quoting and pricing system, the quote vendor will usually provide the translation between option symbols and their meanings. The free option quote section on the CBOE's Web site, *www.cboe.com,* can be useful for that purpose as well. Even with those aids, it is important that an option trader understand the concepts surrounding option symbology.

THE OPTION BASE SYMBOL

The basic option symbol consists of three parts:

Option symbol = Base symbol + Expiration month code + Striking price code

The base symbol is never more than three characters in length. In its simplest form, the base symbol is the same as the stock symbol. That works well for stocks with three or fewer letters in their symbol, such as General Electric (GE) or IBM (IBM), but what about NASDAQ stocks? For NASDAQ stocks, the OCC makes up a three-letter symbol that is used to denote options on the stock. A few examples are:

Stock	Stock Symbol	Option Base Symbol
Cisco	CSCO	CYQ
Microsoft	MSFT	MSQ
Qualcomm	QCOM	QAQ

In the three examples, there is a letter "Q" in each of the option base symbols. However, that is not always the case. The option base symbol assigned by the OCC for a NASDAQ stock may contain any three letters (or, rarely, only two letters).

THE EXPIRATION MONTH CODE

The next part of an option symbol is the expiration month code, which is a one-character symbol. The symbology that has been created actually uses the expiration month code for two purposes: (1) to identify the expiration month of the option, and (2) to designate whether the option is a call or a put.

The concept is generally rather simple. For call options, the letter A stands for January, B for February, and so forth, up through L for December. For put options, the letter M stands for January, N for February, and so forth, up through X for December. The letters Y and Z are *not* used for expiration month codes.

THE STRIKING PRICE CODE

This is also a one-character symbol, designed to identify the striking price of the option. Things can get very complicated where striking price codes are concerned, but simplistically the designations are that the letter A stands for 5, B stands for 10, on up to S for 95 and T for 100. If the stock being quoted is more expensive – say, trading at $150 per share – then it is possible that A will stand for 105, B for 110, S for 195 and T for 200 (although, as will be shown later, a more complicated approach might have to be used in cases such as these). *It should be noted that the exchanges – who designate the striking price codes and their numerical meaning – do* ***not*** *have to adhere to any of the generalized conventions described here.* They usually adhere to as many of them as they can, in order to keep things somewhat standardized, but they can use the letters in any way they want. Typically, they would only use any striking price code letter outside of its conventional designation after a stock has split or perhaps paid a special dividend of some sort.

Before getting into the more complicated option symbol constructions, let's look at a few simple, straightforward examples:

Stock	Stock Symbol	Description	Option Symbol
IBM	IBM	IBM July 125 call	IBMGE
Cisco	CSCO	Cisco April 75 put	CYQPO
Ford Motor	F	Ford March 40 call	FCH
General Motors	GM	GM December 65 put	GMXM

In each option symbol, the last two characters are the expiration month code and the striking price code. Preceding them is the option base symbol. For the IBM July 125, the option symbol is quite straightforward. IBM is the option base symbol (as well as the stock symbol), G stands for July, and E for 125, in this case.

For the Cisco April 75 put, the option base symbol is CYQ (this was given in the previous table, but if one didn't know what the base symbol was, you would have to look it up on the Internet or call a broker). The expiration month code in this case is P, because P stands for an April *put* option. Finally, the striking price code is O, which stands for 75.

The Ford March 40 call and the GM December 65 put are similar to the others, except that the stock symbols only require one and two characters, respectively, so the option symbol is thus a shorter symbol as well – first using the stock symbol, then the standard character for the expiration month, followed by the standard character for the striking price.

MORE STRIKING PRICE CODES

The letters A through T cannot handle all of the possible striking price codes. Recall that many stocks, especially lower-priced ones, have striking prices that are spaced 2½ points apart. In those cases, a special letter designation is usually used for the striking price codes:

Striking Price Code	Possible Meanings
U	7.5 or 37.5 or 67.5 or 97.5 or even 127.5!
V	12.5 or 42.5 or 72.5 or 102.5 or 132.5
W	17.5 or 47.5 or 77.5 or 107.5 or 137.5
X	22.5 or 52.5 or 82.5 or 112.5 or 142.5
Y	27.5 or 57.5 or 87.5 or 117.5 or 147.5
Z	32.5 or 62.5 or 92.5 or 122.5 or 152.5

Typically, only the first or second meaning is used for these letters. The higher-priced ones only occur after a very expensive stock splits 2-for-1 (say, a stock that had a strike price of 155 and split 2-for-1, creating a strike price of 155 divided by 2, or 77.50).

WRAPS

Note that any striking price code can have only one meaning. Thus, if the letter A is being used to designate a strike price of 5, and the underlying stock has a tremendous rally to over $100 per share, then the letter A cannot also be used to designate the strike price of 105. Something else must be done. In the early years of option trading, there was no need for wrap symbols, but in recent – more volatile – times, stocks have risen 100 points during the life of an option.

For example, if XYZ was originally trading at 10, there might be a 9-month, XYZ December 10 call. Its symbol would be XYZLB. If, in the course of the next few months, XYZ traded up to nearly 110 while the December 10 call was still in existence, the exchange would want to trade an XYZ December 110 call. But a new letter would have to be designated for any new strikes (A already stands for 5, so it cannot stand for 105; B already stands for 10, so it cannot stand for 110, etc.). There aren't enough letters in the alphabet to handle this, so the exchange creates an *additional option base symbol, called a wrap symbol.*

In this case, the exchange might say that the option base symbol XYA is now going to be used to designate strike prices of 105 and higher (up to 200) for the common stock whose symbol is XYZ. Having done that, the letter A can be used for 105, B for 110, etc.

Option	Symbol
XYZ December 10 call	XYZLB
XYZ December 110 call	XYALB (wrap symbol is XYA)

Note that the wrap symbol now allows the usage of B in its standard interpretation once again.

This process can be extended. Suppose that, by some miracle, this stock rose to 205 prior to the December expiration. Things like this happened to Yahoo (YHOO), Amazon (AMZN), Qualcomm (QCOM), and others during the 1990s. If that happened, the exchange would now create *another* wrap symbol and use it to designate strike prices from 205 to 300. Suppose XYZ traded up to 210, and the exchange then said that YYA would now be the wrap symbol for the higher strikes. In that case, these symbols would exist:

Option	Symbol
XYZ December 10 call	XYZLB
XYZ December 110 call	XYALB (wrap symbol is XYA)
XYZ December 210 call	YYALB (wrap symbol is YYA)

Note that there doesn't have to be any particular relationship between the wrap symbols and the stock itself; any three-character designation could be used.

LEAPS SYMBOLS

A LEAPS option is one that is very long-term, expiring one or more years hence. Consequently, the expiration month codes encounter a problem with LEAPS similar to the one seen for striking price codes where wraps are concerned. The letter A stands for January as an expiration month code. However, if there is a LEAPS option on this same stock, and that LEAPS option expires in January of the *next* year, the letter A cannot be used to designate the expiration month of the LEAPS option, since it is already being used for the "standard" option. *Consequently, LEAPS options have a different base option symbol than the "standard" base option symbol.*

Example: The current year is 2001. The OCC might have designated that, for IBM, LEAPS options expiring in the year 2002 will have the option base symbol VBM, and those expiring in the year 2003 will have the option base symbol WBM. Thus, the following symbols would be used to describe the designated options:

Option Description	Option Symbol
IBM January 125 call (expiring in 2001)	IBMAE
IBM January 125 call (expiring in 2002)	VBMAE
IBM January 125 call (expiring in 2003)	WBMAE
IBM January 125 put (expiring in 2003)	WBMME

Note that the last line shows a LEAPS *put* option symbol. The letter M stands for a January *put option* – the standard usage for the expiration month code.

STOCK SPLITS

Stock splits often wreak havoc on option symbols, as the exchanges are forced to use the standard characters in nonstandard ways in order to accommodate all the additional strikes that are created when a stock splits. The actual discussion of stock splits and the resultant option symbology is deferred to the next section.

SYMBOLOGY SUMMARY

The exchanges do a good job of making symbol information available. Each exchange has a Web site where memos detailing the changes required by LEAPS, wraps, and splits are available for viewing.

The OCC and the exchanges have been forced to create multiple option base symbols for a single stock in order to accommodate the various strike price and expiration month situations – to avoid duplication of the standardized character used for the strike or expiration month. This is unwieldy and confusing for option traders and for data vendors as well. In some rare cases, mistakes are made, and there can briefly be two designations for the same option symbol. The only way to eliminate this confusion would be to use a longer, more descriptive option symbol that included the expiration year and the striking price as numerical values, much as is done with futures options. It is the member firms themselves and some of the quote vendors who object to the transformation to this less confusing system, because they would have to recode their software and alter their databases.

DETAILS OF OPTION TRADING

The facts that the strategist should be concerned with are included in this section. They are not presented in any particular order of importance, and this list is not necessarily complete. Many more details are given in the discussion of specific strategies throughout this text.

1. *Options expire on the Saturday following the third Friday of the expiration month, although the third Friday is the last day of trading.* In general, however, waiting past 3:30 P.M. on the last day to place orders to buy or sell the expiring options is not advisable. In the "crush" of orders during the final minutes of trading, even a market order may not have enough time to be executed.
2. *Option trades have a one-day settlement cycle.* The trade settles on the next business day after the trade. Purchases must be paid for in full, and the credits from sales "hit" the account on the settlement day. Some brokerage firms require settlement on the same day as the trade, when the trade occurs on the last trading day of an expiration series.
3. *Options are opened for trading in rotation.* When the underlying stock opens for trading on any exchange, regional or national, the options on that stock then go into opening rotation on the corresponding option exchange. The rotation system also applies if the underlying stock halts trading and then reopens during a trading day; options on that stock reopen via a rotation.

   In the rotation itself, interested parties make bids and offers for each particular option series one at a time – the XYZ January 45 call, the XYZ January 50 call, and so on – until all the puts and calls at various expiration dates and striking prices have been opened. Trades do not necessarily have to take place in each series, just bids and offers. Orders such as spreads, which involve more than one option, are not executed during a rotation.

   While the rotation is taking place, it is possible that the underlying stock could make a substantial move. This can result in option prices that seem unrealistic when viewed from the perspective of each option's opening. Consequently, the *opening* price of an option can be a somewhat suspicious statistic, since none of them open at exactly the same time.

   Also, it should be noted that most option traders do *not* trade during rotation, so a market order may receive a very poor price. Hence, if one is considering trading during rotation, a *limit order* should be used. (Order entry is discussed in more detail in a later section of this chapter.)
4. *When the underlying stock splits or pays a stock dividend, the terms of its options are adjusted.* Such an adjustment may result in fractional striking prices and in options for other than 100 shares per contract. No adjustments in terms are made for cash dividends. The actual details of splits, stock dividends, and rights offerings, along with their effects on the option terms, are always published by the option exchange that trades those options. Notices are sent to all member firms, who then make that information available to their brokers for distribution to clients. In actual practice, the option strategist should ascertain from the broker

1. *Options expire on the Saturday following the third Friday of the expiration month, although the third Friday is the last day of trading.* In general, however, waiting past 3:30 P.M. on the last day to place orders to buy or sell the expiring options is not advisable. In the "crush" of orders during the final minutes of trading, even a market order may not have enough time to be executed.
2. *Option trades have a one-day settlement cycle.* The trade settles on the next business day after the trade. Purchases must be paid for in full, and the credits from sales "hit" the account on the settlement day. Some brokerage firms require settlement on the same day as the trade, when the trade occurs on the last trading day of an expiration series.
3. *Options are opened for trading in rotation.* When the underlying stock opens for trading on any exchange, regional or national, the options on that stock then go into opening rotation on the corresponding option exchange. The rotation system also applies if the underlying stock halts trading and then reopens during a trading day; options on that stock reopen via a rotation.

   In the rotation itself, interested parties make bids and offers for each particular option series one at a time – the XYZ January 45 call, the XYZ January 50 call, and so on – until all the puts and calls at various expiration dates and striking prices have been opened. Trades do not necessarily have to take place in each series, just bids and offers. Orders such as spreads, which involve more than one option, are not executed during a rotation.

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the specific terms of the new option series, in case the broker has overlooked the information sent.

Example 1: XYZ is a $50 stock with option striking prices of 45, 50, and 60 for the January, April, and July series. It declares a 2-for-1 stock split. Usually, in a 2-for-1 split situation, the number of outstanding option contracts is doubled and the striking prices are halved. The owner of 5 XYZ January 60 calls becomes the owner of 10 XYZ January 30 calls. Each call is still for 100 shares of the underlying stock.

If *fractional striking prices* arise, the exchange also publishes the quote symbol that is to be used to find the price of the new option. The XYZ July 45 call has a symbol of XYZGI: G stands for July and I is for 45. After the 2-for-1 split, one July 45 call becomes 2 July 22½ calls. The strike of 22½ is assigned a letter. The exchanges usually attempt to stay with the standard symbols as much as possible, meaning that X would be designated for 22½. Hence, the symbol for the XYZ July 22½ call would be XYZGX.

After the split, XYZ has options with strikes of 22½, 25, and 30. In some cases, the option exchange officials may introduce another strike if they feel such a strike is necessary; in this example, they might introduce a striking price of 20.

Example 2: UVW Corp. is now trading at 40 with strikes of 35, 40, and 45 for the January, April, and July series. UVW declares a 2½ percent stock dividend. The contractually standardized 100 shares is adjusted up to 102, and the striking prices are reduced by 2 percent (rounded to the nearest eighth). Thus, the "old" 35 strike becomes a "new" strike of 34⅜: 1.02 divided into 35 equals 34.314, which is 34⅜ when rounded to the nearest eighth. The "old" 40 strike becomes a "new" strike of 39¼, and the "old" 45 strike becomes 44⅛. Since these new strikes are all fractional, they are given special symbols – probably U, V, and W. Thus, the "old" symbol UVWDH (UVW April 40) becomes the "new" symbol UVWDV (UVW April 39¼).

After the split, the exchange usually opens for trading new strikes of 35, 40, and 45 – each for 100 shares of the underlying stock. For a while, there are six striking prices for UVW options. As time passes, the fractional strikes are eliminated as they expire. Since they are not reintroduced, they eventually disappear as long as UVW does not issue further stock dividends.

Example 3: WWW Corp. (symbol WWW) is trading at $120 per share, with strike prices of 110, 115, 120, 125, and 130. WWW declares a 3-for-1 split. In this case, the strike prices would be divided by 3 (and rounded to the nearest eighth); the number of contracts in every account would be tripled; and each option would still be an option on 100 shares of WWW stock. The general rule of thumb is that when a split results in round lots (2-for-1, 3-for-1, 4-for-1, etc.), the number of option contracts is

increased and the strike price is decreased, and each option still represents 100 shares of the underlying stock.

In this case, the strikes listed above (110 through 130) would be adjusted to become new strikes: 36.625, 38.375, 40, 41.625, and 43.375. The 40 strike would be assigned the standard strike price symbol of the letter H. However, the others would need to be designated by the exchange, so U might stand for 38.375, V for 41.625, and so forth.

Example 4: When a split does not result in a round lot, a different adjustment must be used for the options. Suppose that AAA Corp. (symbol: AAA) is trading at $60 per share and declares a 3-for-2 split. In this case, each option's strike will be multiplied by two-thirds (to reflect the 3-for-2 split), *but the number of contracts held in an account will remain the same and each option will be an option on 150 shares of AAA stock.*

Suppose that there were strikes of 55, 60, and 65 preceding this split. After the split, AAA common itself would be trading at $40 per share, reflecting the post-split 3-for-2 adjustment from its previous price of 60. There would be new options with strikes of 36.625, 40, and 43.375 (these had been the pre-split strikes of 55, 60, and 65).

Since each of these options would be for 150 shares of the underlying stock, the exchange creates a *new option base symbol* for these options, because they no longer represent 100 shares of AAA common. Suppose the exchange says that the post-split, 150-share option contracts will henceforth use the option symbol AAX.

After the split, the exchange will then list "normal" 100-share options on AAA, perhaps with strike prices of 35, 40, and 45. This creates a situation that can sometimes be confusing for traders and can lead to problems. There will actually be two options with striking prices of 40 – one for 100 shares and the other for 150 shares. Suppose the July contract is being considered. The option with symbol AAAGH is a July 40 option on 100 shares of AAA Corp., while the option with symbol AAXGH is a July 40 option on 150 shares of AAA Corp. Since option prices are quoted on a per-share basis, *they will have nearly identical price quotes on any quote system* (see item 5). If one is not careful, you might trade the wrong one, thereby incurring a risk that you did not intend to take.

For example, suppose that you sell, as an opening transaction, the AAXGH July 40 call at a price of 3. Furthermore, suppose that you did not realize that you were selling the 150-share option; this was a mistake, but you don't yet realize it. A couple of days later, you see that this option is now selling at 13 – a loss of 10 points. You might think that you had just lost $1,000, but upon examining your brokerage statement (or confirms, or day trading sheet), you suddenly see that the loss is $1,500 on

that contract! Quite a difference, especially if multiple contracts are involved. This could come as a shock if you thought you were hedged (perhaps you bought 100 shares of AAA common when you sold this call), only to find out later that you didn't have a correctly hedged position in place after all.

Even more severe problems can arise if this stock splits *again* during the life of this option. Sometimes the options will be adjusted so that they represent a non-standard number of shares, such as the 150-share options involved here; and after multiple splits, the exchange may even apply a multiplier to the option, rather than adjusting its strike price repeatedly. This type of thing wouldn't happen on the first stock split, but it might occur on subsequent stock splits, spaced closely together over the life of an option. In such a case, the dollar value of the option moves *much* faster than one would expect from looking at a quote of the contract.

So you must be sure that you are trading the exact contract you intend to, and not relying on the fact that the striking price is correct and the option price quote seems to be in line. One must verify that the option being bought or sold is exactly the one intended. In general, it is a good idea, after a split or similar adjustment, to establish opening positions solely with the standard contracts and to leave the split-adjusted contracts alone.

5. *All options are quoted on a per-share basis,* regardless of how many shares of stock the option involves. Normally the quote assumes 100 shares of the underlying stock. However, in a case like the UVW options just described, a quote of 3 for the UVW April 39¼ means a dollar price of \$306 (\$3 × 102).
6. *Changes in the price of the underlying stock can also bring about new striking prices.* XYZ is a \$47 stock with striking prices of 45 and 50. If the price of XYZ stock falls to \$40, the striking prices of 45 and 50 do not give option traders enough opportunities in XYZ. So the exchange might introduce a new striking price of 40. In practice, a new series is generally opened when the stock trades at the lowest (or highest) existing strike in any series. For example, if XYZ is falling, as soon as it traded at or below 45, the striking price of 40 may be introduced. The officials of the option exchange that trades XYZ options make the decision as to the exact day when the strike begins trading.

POSITION LIMIT AND EXERCISE LIMIT

7. *An investor or a group of investors cannot be long or short more than a set limit of contracts in one stock on the same side of the market.* The actual limit varies according to the trading activity in the underlying stock. The most heavily traded stocks with a large number of shares outstanding have position limits of 75,000

contracts. Smaller stocks have position limits of 60,000, 31,000, 22,500, or 13,500 contracts. These limits can be expected to increase over time, if stocks' capitalizations continue to increase. The exchange on which the option is listed makes available a list of the position limits on each of its optionable stocks. So, if one were long the limit of XYZ call options, he cannot at the same time be short any XYZ put options. Long calls and short puts are on the same side of the market; that is, both are bullish positions. Similarly, long puts and short calls are both on the bearish side of the market. While these position limits generally exceed by far any position that an individual investor normally attains, the limits apply to "related" accounts. For instance, a money manager or investment advisor who is managing many accounts cannot exceed the limit when all the accounts' positions are combined.

8. *The number of contracts that can be exercised in a particular period of time (usually 5 business days) is also limited to the same amount as the position limit.* This exercise limit prevents an investor or group from "cornering" a stock by repeatedly buying calls one day and exercising them the next, day after day. *Option exchanges set exact limits, which are subject to change.*

ORDER ENTRY

Order Information

Of the various types of orders, each specifies:

1. whether the transaction is a buy or sell,
2. the option to be bought or sold,
3. whether the trade is opening or closing a position,
4. whether the transaction is a spread (discussed later), and
5. the desired price.

TYPES OF ORDERS

Many types of orders are acceptable for trading options, but not all are acceptable on all exchanges that trade options. Since regulations change, information regarding which order is valid for a given exchange is best supplied by the broker to the customer. The following orders are acceptable on all option exchanges:

Market Order. This is a simple order to buy or sell the option at the best possible price as soon as the order gets to the exchange floor.

Market Not Held Order. The customer who uses this type of order is giving the floor broker discretion in executing the order. The floor broker is not held responsible for the final outcome. For example, if a floor broker has a "market not held" order to buy, and he feels that the stock will "downtick" (decline in price) or that there is a surplus of sellers in the crowd, he may often hold off on the execution of the buy order, figuring that the price will decline shortly and that the order can then be executed at a more favorable price. In essence, the customer is giving the floor broker the right to use some judgment regarding the execution of the order. If the floor broker has an opinion and that opinion is correct, the customer will probably receive a better price than if he had used a regular market order. If the broker's opinion is wrong, however, the price of the execution may be worse than a regular market order.

Limit Order. The limit order is an order to buy or to sell at a specified price – the limit. It may be executed at a better price than the limit – a lower one for buyers and a higher one for sellers. However, if the limit is never reached, the order may never be executed.

Sometimes a limit order may specify a discretionary margin for the floor broker. In other words, the order may read "Buy at 5 with dime discretion." This instruction enables the floor broker to execute the order at 5.10 if he feels that the market will never reach 5. Under no circumstances, however, can the order be executed at a price higher than 5.10. Other orders may or may not be accepted on some option exchanges.

Stop Order. This order is not always valid on all option exchanges. A stop order becomes a market order when the security trades at or through the price specified on the order. Buy stop orders are placed above the current market price, and sell stop orders are entered below the current market price. Such orders are used to either limit loss or protect a profit. For example, if a holder's option is selling for 3, a sell stop order for 2 is activated if the market drops down below the 2 level, whereupon the floor broker would execute the order as soon as possible. The customer, however, is not guaranteed that the trade will be exactly at 2.

Stop-Limit Order. This order becomes a limit order when the specified price is reached. Whereas the stop order has to be executed as soon as the stop price is reached, the stop-limit may or may not be filled, depending on market behavior. For instance, if the option is trading at 3 while a stop-limit order is placed at a price of 2, the floor broker may not be able to get a trade exactly at 2. If the

option continues to decline through 2 – 1.90, 1.80, 1.70, and so on – without ever regaining the 2 level, then the broker's hands are tied. He may not execute what is now a limit order unless the call trades at 2.

Good-Until-Canceled Order. A limit, stop, or stop-limit order may be designated "good until canceled." If the conditions for the order execution do not occur, the order remains valid for 6 months without renewal by the customer.

Customers using an on-line broker will not be able to enter "market not held" orders, and may not be able to use stop orders or good-until-canceled orders either, depending on the brokerage firm.

PROFITS AND PROFIT GRAPHS

A visual presentation of the profit potential of any position is important to the overall understanding and evaluation of it. In option trading, the many multi-security positions especially warrant strict analysis: stock versus options (as in covered or ratio writing) or options versus options (as in spreads). Some strategists prefer a table listing the outcomes of a particular strategy for the stock at various prices; others think the strategy is more clearly demonstrated by a graph. In the rest of the text, both a table and a graph will be presented for each new strategy discussed.

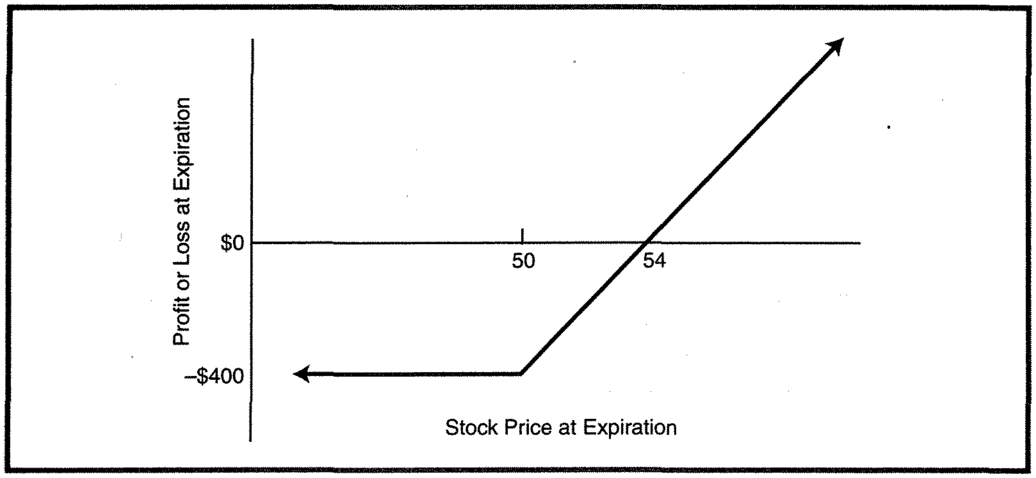
Example: A customer wishes to evaluate the purchase of a call option. The potential profits or losses of a purchase of an XYZ July 50 call at 4 can be arrayed in either a table or a graph of outcomes at expiration. Both Table 1-5 and Figure 1-5 depict the same information; the graph is merely the line representing the column marked "Profit or Loss" in the table. The vertical axis represents dollars of profit or loss, and the horizontal axis shows the stock price at expiration. In this case, the dollars of profit and the stock price are at the expiration date. Often, the strategist wants to determine what the potential profits and losses will be before expiration, rather than at the expiration date itself. Tables and graphs lend themselves well to the necessary analysis, as will be seen in detail in various places later on.

In practice, such an example is too simple to require a table or a graph – certainly not both – to evaluate the potential profits and losses of a simple call purchase held to expiration. However, as more complex strategies are discussed, these tools become ever more useful for quickly determining such things as when a position makes money and when it loses, or how fast one's risk increases at certain stock prices.

TABLE 1-5.
Potential profits and losses for an XYZ call purchase.

XYZ Price at Expiration	Call Price at Expiration	Profit or Loss
40	$ 0	–$ 400
45	0	– 400
50	0	– 400
55	5	+ 100
60	10	+ 600
70	20	+ 1,600

FIGURE 1-5.
Graph of potential profits for an XYZ call purchase.



PART II

Call Option Strategies

INTRODUCTION

The average person dealing in option trading utilizes primarily one of two option strategies – call buying or covered call writing. These strategies are, at face value, simple, and they are therefore the ones most often tried. There are many more strategies involving the use of call options, many of which will be described later in this Part. However, Chapters 2 and 3 deal with the fundamental call option strategies.

Both covered call writing and call buying are relatively simple strategies, but, like any investment, they can be employed with differing levels of skill and complexity. The discussions to follow begin by describing the basics of each strategy and then discuss each in depth.

CHAPTER 2

Covered Call Writing

Covered call writing is the name given to the strategy by which one sells a call option while simultaneously owning the obligated number of shares of underlying stock. The writer should be mildly bullish, or at least neutral, toward the underlying stock. By writing a call option against stock, one always decreases the risk of owning the stock. It may even be possible to profit from a covered write if the stock declines somewhat. However, the covered call writer does limit his profit potential and therefore may not fully participate in a strong upward move in the price of the underlying stock. Use of this strategy is becoming so common that the strategist must understand it thoroughly. It is therefore discussed at length.

THE IMPORTANCE OF COVERED CALL WRITING

COVERED CALL WRITING FOR DOWNSIDE PROTECTION

Example: An investor owns 100 shares of XYZ common stock, which is currently selling at $48 per share. If this investor sells an XYZ July 50 call option while still holding his stock, he establishes a covered write. Suppose the investor receives $300 from the sale of the July 50 call. If XYZ is below 50 at July expiration, the call option that was sold expires worthless and the investor earns the $300 that he originally received for writing the call. Thus, he receives $300, or 3 points, of downside protection. That is, he can afford to have the XYZ stock drop by 3 points and still break even on the total transaction. At that time he can write another call option if he so desires.

Note that if the underlying stock should fall by more than 3 points, there will be a loss on the overall position. *Thus, the risk in the covered writing strategy materializes if the stock falls by a distance greater than the call option premium that was originally taken in.*

THE BENEFITS OF AN INCREASE IN STOCK PRICE

If XYZ increases in price moderately, the trader may be able to have the best of both worlds.

Example: If XYZ is at or just below 50 at July expiration, the call still expires worthless, and the investor makes the $300 from the option in addition to having a small profit from his stock purchase. Again, he still owns the stock.

Should XYZ increase in price by expiration to levels above 50, the covered writer has a choice of alternatives. As one alternative, he could do nothing, in which case the option would be assigned and his stock would be called away at the striking price of 50. In that case, his profits would be equal to the $300 received from selling the call plus the profit on the increase of his stock from the purchase price of 48 to the sale price of 50. In this case, however, he would no longer own the stock. If as another alternative he desires to retain his stock ownership, he can elect to buy back (or cover) the written call in the open market. This decision might involve taking a loss on the option part of the covered writing transaction, but he would have a correspondingly larger profit, albeit unrealized, from his stock purchase. Using some specific numbers, one can see how this second alternative works out.

Example: XYZ rises to a price of 60 by July expiration. The call option then sells near its intrinsic value of 10. If the investor covers the call at 10, he loses $700 on the option portion of his covered write. (Recall that he originally received $300 from the sale of the option, and now he is buying it back for $1,000.) However, he relieves the obligation to sell his stock at 50 (the striking price) by buying back the call, so he has an unrealized gain of 12 points in the stock, which was purchased at 48. His total profit, including both realized and unrealized gains, is $500.

This profit is exactly the same as he would have made if he had let his stock be called from him. If called, he would keep the $300 from the sale of the call, and he would make 2 points ($200) from buying the stock at 48 and selling it, via exercise, at 50. This profit, again, is a total of $500. The major difference between the two cases is that the investor no longer owns his stock after letting it be called away, whereas he retains stock ownership if he buys back the written call. Which of the two alternatives is the better one in a given situation is not always clear.

No matter how high the stock climbs in price, the profit from a covered write is limited because the writer has obligated himself to sell stock at the striking price. The covered writer still profits when the stock climbs, but possibly not by as much as he might have had he not written the call. On the other hand, he is receiving $300 of immediate cash inflow, because the writer may take the premium immediately and

do with it as he pleases. That income can represent a substantial increase in the income currently provided by the dividends on the underlying stock, or it can act to offset part of the loss in case the stock declines.

For readers who prefer formulae, the profit potential and break-even point of a covered write can be summarized as follows:

Maximum profit potential = Strike price – Stock price + Call price
Downside break-even point = Stock price – Call price

QUANTIFICATION OF THE COVERED WRITE

Table 2-1 and Figure 2-1 depict the *profit graph* for the example involving the XYZ covered write of the July 50 call. The table makes the assumption that the call is bought back at parity. If the stock is called away, the same total profit of $500 results; but the price involved on the stock sale is always 50, and the option profit is always $300.

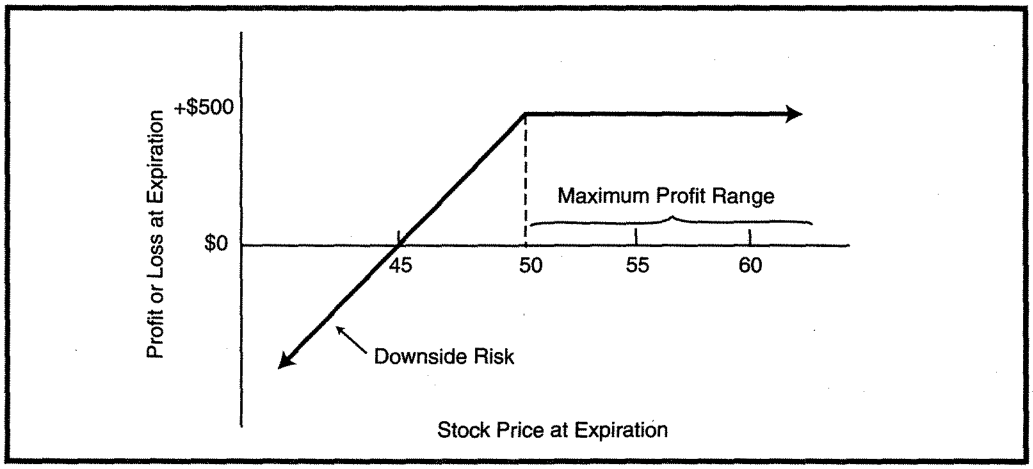
Several conclusions can be drawn. The break-even point is 45 (zero total profit) with risk below 45; the maximum profit attainable is $500 if the position is held until expiration; and the profit if the stock price is unchanged is $300, that is, the covered writer makes $300 even if his stock goes absolutely nowhere.

The profit graph for a covered write always has the shape shown in Figure 2-1. Note that the maximum profit always occurs at all stock prices equal to or greater than the striking price, if the position is held until expiration. However, there is downside risk. If the stock declines in price by too great an amount, the option premium cannot possibly compensate for the entire loss. Downside protective strategies, which are discussed later, attempt to deal with the limitation of this downside risk.

TABLE 2-1.
The XYZ July 50 call.

XYZ Price at Expiration	Stock Profit	July 50 Call at Expiration	Call Profit	Total Profit
40	–$ 800	0	+$300	–$500
45	– 300	0	+ 300	0
48	– 0	0	+ 300	+ 300
50	+ 200	0	+ 300	+ 500
55	+ 700	5	– 200	+ 500
60	+ 1,200	10	– 700	+ 500

FIGURE 2-1.
XYZ covered write.



COVERED WRITING PHILOSOPHY

The primary objective of covered writing, for most investors, is increased income through stock ownership. An ever-increasing number of private and institutional investors are writing call options against the stocks that they own. The facts that the option premium acts as a partial compensation for a decline in price by the underlying stock, and that the premium represents an increase in income to the stockholder, are evident. *The strategy of owning the stock and writing the call will outperform outright stock ownership if the stock falls, remains the same, or even rises slightly.* In fact, the only time that the outright owner of the stock will outperform a covered writer is if the stock increases in price by a relatively substantial amount during the life of the call. Moreover, if one consistently writes call options against his stock, *his portfolio will show less variability of results from quarter to quarter.* The total position – long stock and short option – has less volatility than the stock alone, so on a quarter-by-quarter basis, results will be closer to average than they would be with normal stock ownership. This is an attractive feature, especially for portfolio managers.

However, one should not assume that covered writing will outperform stock ownership. Stocks sometimes tend to make most of their gains in large spurts. A covered writer will not participate in moves such as that. The long-term gains that are quoted for holding stocks include periods of large gains and sometimes periods of large losses as well. The covered writer will not participate in the largest of those gains, since his profit potential is limited.

PHYSICAL LOCATION OF THE STOCK

Before getting more involved in the details of covered writing strategy, it may be useful to review exactly what stock holdings may be written against. Recall that this discussion applies to listed options. If one has deposited stock with his broker in either a cash or a margin account, he may write an option for each 100 shares that he owns without any additional requirement. However, it is possible to write covered options without actually depositing stock with a brokerage firm. There are several ways in which to do this, all involving the deposit of stock with a bank.

Once the stock is deposited with the bank, the investor may have the bank issue an escrow receipt or letter of guarantee to the brokerage firm at which the investor does his option business. The bank must be an "approved" bank in order for the brokerage firm to accept a *letter of guarantee,* and not all firms accept letters of guarantee. These items cost money, and as a new receipt or letter is required for each new option written, the costs may become prohibitive to the customer if only 100 or 200 shares of stock are involved. The cost of an escrow receipt can range from as low as $15 to upward of $40, depending on the bank involved.

There is another alternative open to the customer who wishes to write options without depositing his stock at the brokerage firm. He may deposit his stock with a bank that is a member of the *Depository Trust Corporation* (DTC). The DTC guarantees the Options Clearing Corporation that it will, in fact, deliver stock should an assignment notice be given to the call writer. This is the most convenient method for the investor to use, and is the one used by most of the institutional covered writing investors. There is usually no additional charge for this service by the bank to institutional accounts. However, since only a limited number of banks are members of DTC, and these banks are generally the larger banks located in metropolitan centers, it may be somewhat difficult for many individual investors to take advantage of the DTC opportunity.

TYPES OF COVERED WRITES

While all covered writes involve selling a call against stock that is owned, different terms are used to describe various categories of covered writing. The two broadest terms, under which all covered writes can be classified, are the *out-of-the-money covered write* and the *in-the-money covered write.* These refer, obviously, to whether the option itself was in-the-money or out-of-the-money when the write was first established. Sometimes one may see covered writes classified by the nature of the stock involved (low-priced covered write, high-yield covered write, etc.), but these are only subcases of the two broad categories.

In general, out-of-the-money covered writes offer higher potential rewards but have less risk protection than do in-the-money covered writes. One can establish an aggressive or defensive covered writing position, depending on how far the call option is in- or out-of-the-money when the write is established. In-the-money writes are more defensive covered writing positions.

Some examples may help to illustrate how one covered write can be considerably more conservative, from a strategy viewpoint, than another.

Example: XYZ common stock is selling at 45 and two options are being considered for writing: an XYZ July 40 selling for 8, and an XYZ July 50 selling for 1. Table 2-2 depicts the profitability of utilizing the July 40 or the July 50 for the covered writing. The in-the-money covered write of the July 40 affords 8 points, or nearly 18% protection down to a price of 37 (the break-even point) at expiration. The out-of-the-money covered write of the July 50 offers only 1 point of downside protection at expiration. Hence, *the in-the-money covered write offers greater downside protection than does the out-of-the-money covered write.* This statement is true in general – not merely for this example.

In the balance of the financial world, it is normally true that investment positions offering less risk also have lower reward potential. The covered writing example just given is no exception. The in-the-money covered write of the July 40 has a maximum potential profit of $300 at any point above 40 at the time of expiration. However, the out-of-the-money covered write of the July 50 has a maximum potential profit of $600 at any point above 50 at expiration. *The maximum potential profit of an out-of-the-money covered write is generally greater than that of an in-the-money write.*

TABLE 2-2.
Profit or loss of the July 40 and July 50 calls.

In-the-Money Write of July 40		Out-of-the-Money Write of July 50	
Stock at Expiration	Total Profit	Stock at Expiration	Total Profit
35	–$200	35	–$900
37	0	40	– 400
40	+ 300	44	0
45	+ 300	45	+ 100
50	+ 300	50	+ 600
60	+ 300	60	+ 600

To make a true comparison between the two covered writes, one must look at what happens with the stock between 40 and 50 at expiration. The in-the-money write attains its maximum profit anywhere within that range. Even a 5-point decline by the underlying stock at expiration would still leave the in-the-money writer with his maximum profit. However, *realizing the maximum profit potential with an out-of-the-money covered write always requires a rise in price by the underlying stock.* This further illustrates the more conservative nature of the in-the-money write. It should be noted that in-the-money writes, although having a smaller profit potential, can still be attractive on a percentage return basis, especially if the write is done in a margin account.

One can construct a more aggressive position by writing an out-of-the-money call. One's outlook for the underlying stock should be bullish in that case. If one is neutral or moderately bearish on the stock, an in-the-money covered write is more appropriate. If one is truly bearish on a stock he owns, he should sell the stock instead of establishing a covered write.

THE TOTAL RETURN CONCEPT OF COVERED WRITING

When one writes an out-of-the-money option, the overall position tends to reflect more of the result of the stock price movement and less of the benefits of writing the call. Since the premium on an out-of-the-money call is relatively small, the total position will be quite susceptible to loss if the stock declines. If the stock rises, the position will make money regardless of the result in the option at expiration. On the other hand, an in-the-money write is more of a "total" position – taking advantage of the benefit of the relatively large option premium. If the stock declines, the position can still make a profit; in fact, it can even make the maximum profit. Of course, an in-the-money write will also make money if the stock rises in price, but the profit is not generally as great in percentage terms as is that of an out-of-the-money write.

Those who believe in the *total return concept of covered writing* consider both downside protection and maximum potential return as important factors and are willing to have the stock called away, if necessary, to meet their objectives. When premiums are moderate or small, only in-the-money writes satisfy the total return philosophy.

Some covered writers prefer never to lose their stock through exercise, and as a result will often write options quite far out-of-the-money to minimize the chances of being called by expiration. These writers receive little downside protection and, to make money, must depend almost entirely on the results of the stock itself. Such a

philosophy is more like being a stockholder and trading options against one's stock position than actually operating a covered writing strategy. In fact, some covered writers will attempt to buy back written options for quick profits if such profits materialize during the life of the covered write. This, too, is a stock ownership philosophy, not a covered writing strategy. The total return concept represents the true strategy in covered writing, whereby one views the entire position as a single entity and is not predominantly concerned with the results of his stock ownership.

THE CONSERVATIVE COVERED WRITE

Covered writing is generally accepted to be a conservative strategy. This is because the covered writer always has less risk than a stockholder, provided that he holds the covered write until expiration of the written call. If the underlying stock declines, the covered writer will always offset part of his loss by the amount of the option premium received, no matter how small.

As was demonstrated in previous sections, however, some covered writes are clearly more conservative than others. Not all option writers agree on what is meant by a conservative covered write. Some believe that it involves writing an option (probably out-of-the-money) on a conservative stock, generally one with high yield and low volatility. It is true that the stock itself in such a position is conservative, but the position is more aptly termed a *covered write on a conservative stock.* This is distinctly different from a conservative covered write.

A true *conservative covered write* is one in which the total position is conservative – offering reduced risk and a good probability of making a profit. An in-the-money write, even on a stock that itself is not conservative, can become a conservative total position when the option itself is properly chosen. Clearly, an investor cannot write calls that are too deeply in-the-money. If he did, he would get large amounts of downside protection, but his returns would be severely limited. If all that one desired was maximum protection of his money at a nominal rate of profit, he could leave the money in a bank. Instead, the conservative covered writer strives to make a potentially acceptable return while still receiving an above-average amount of protection.

Example: Again assume XYZ common stock is selling at 45 and an XYZ July 40 call is selling at 8. A covered write of the XYZ July 40 would require, in a cash account, an investment of $3,700 – $4,500 to purchase 100 shares of XYZ, less the $800 received in option premiums. The write has a maximum profit potential of $300. The potential return from this position is therefore $300/$3,700, just over 8% for the period during which the write must be held. Since it is most likely that the option has 9 months of life or less, this return would be well in excess of 10% on a per annum

basis. If the write were done in a margin account, the return would be considerably higher.

Note that we have ignored dividends paid by the underlying stock and commission charges, factors that are discussed in detail in the next section. Also, one should be aware that if he is looking at an *annualized return* from a covered write, there is no guarantee that such a return could actually be obtained. All that is certain is that the writer could make 8% in 9 months. There is no guarantee that 9 months from now, when the call expires, there will be an equivalent position to establish that will extend the same return for the remainder of the annualization period. Annual returns should be used only for comparative purposes between covered writes.

The writer has a position that has an annualized return (for comparative purposes) of over 10% and 8 points of downside protection. Thus, the *total position* is an investment that will not lose money unless XYZ common stock falls by more than 8 points, or about 18%; and is an investment that could return the equivalent of 10% annually should XYZ common stock rise, remain the same, or fall by 5 points (to 40). This is a conservative position. Even if XYZ itself is not a conservative stock, the action of writing this option has made the *total position* a conservative one. The only factor that might detract from the conservative nature of the total position would be if XYZ were so volatile that it could easily fall more than 8 points in 9 months.

In a strategic sense, the total position described above is better and more conservative than one in which a writer buys a conservative stock – yielding perhaps 6 or 7% – and writes an out-of-the-money call for a minimal premium. If this conservative stock were to fall in price, the writer would be in danger of being in a loss situation, because here the option is not providing anything more than the most minimal downside protection. As was described earlier, a high-yielding, low-volatility stock will not have much time premium in its in-the-money options, so that one cannot effectively establish an in-the-money write on such a "conservative" stock.

COMPUTING RETURN ON INVESTMENT

Now that the reader has some general feeling for covered call writing, it is time to discuss the specifics of computing return on investment. One should always know exactly what his potential returns are, including all costs, when he establishes a covered writing position. Once the procedure for computing returns is clear, one can more logically decide which covered writes are the most attractive.

There are three basic elements of a covered write that should be computed before entering into the position. The first is the *return if exercised.* This is the return on investment that one would achieve if the stock were called away. For an out-of-the-

money covered write, it is necessary for the stock to rise in price in order for the return if exercised to be achieved. However, for an in-the-money covered write, the return if exercised would be attained even if the stock were unchanged in price at option expiration. Thus, it is often advantageous to compute the *return if unchanged* – that is, the return that would be realized if the underlying stock were unchanged when the option expired. One can more fairly compare out-of-the-money and in-the-money covered writes by using the return if unchanged, since no assumption is made concerning stock price movement. The third important statistic that the covered writer should consider is the exact *downside break-even point* after all costs are included. Once this downside break-even point is known, one can readily compute the percentage of *downside protection* that he would receive from selling the call.

Example 1: An investor is considering the following covered write of a 6-month call: Buy 500 XYZ common at 43, sell 5 XYZ July 45 calls at 3. One must first compute the net investment required (Table 2-3). In a cash account, this investment consists of paying for the stock in full, less the net proceeds from the sale of the options. Note that this net investment figure includes all commissions necessary to establish the position. (The commissions used here are approximations, as they vary from firm to firm.) Of course, if the investor withdraws the option premium, as he is free to do, his net investment will consist of the stock cost plus commissions. Once the necessary investment is known, the writer can compute the return if exercised. Table 2-4 illustrates the computation. One first computes the profit if exercised and then divides that quantity by the net investment to obtain the return if exercised. Note that dividends are included in this computation; it is assumed that XYZ stock will pay $500 in dividends on the 500 shares during the life of the call. Moreover, all commissions are included as well – the net investment includes the original stock purchase and option sale commissions, and the stock sale commission is explicitly listed.

For the return computed here to be realized, XYZ stock would have to rise in price from its current price of 43 to any price above 45 by expiration. As noted earlier, it may be more useful to know what return could be made by the writer if the stock did not move anywhere at all. Table 2-5 illustrates the method of computing the

TABLE 2-3.
Net investment required—cash account.

Stock cost (500 shares at 43)	$21,500
Plus stock purchase commissions	+ 320
Less option premiums received	– 1,500
Plus option sale commissions	+ 60
Net cash investment	$20,380

TABLE 2-4.
Return if exercised—cash account.

Stock sale proceeds (500 shares at 45)	$22,500
Less stock sale commissions	– 330
Plus dividends earned until expiration	+ 500
Less net investment	– 20,380
Net profit if exercised	$ 2,290

$$\text{Return if exercised} = \frac{\$2,290}{\$20,380} = 11.2\%$$

TABLE 2-5.
Return if unchanged—cash account.

Unchanged stock value (500 shares at 43)	$21,500
Plus dividends	+ 500
Less net investment	– 20,380
Profit if unchanged	$ 1,620

$$\text{Return if unchanged} = \frac{\$1,620}{\$20,380} = 7.9\%$$

return if unchanged – also called the *static return* and sometimes *incorrectly* referred to as the "expected return." Again, one first calculates the profit and then calculates the return by dividing the profit by the net investment. An important point should be made here: There is no stock sale commission included in Table 2-5. This is the most common way of calculating the return if unchanged; it is done this way because in a majority of cases, one would continue to hold the stock if it were unchanged and would write another call option against the same stock. Recall again, though, that *if the written call is in-the-money, the return if unchanged is the same as the return if exercised.* Stock sale commissions must therefore be included in that case.

Once the necessary returns have been computed and the writer has a feeling for how much money he could make in the covered write, he next computes the exact *downside break-even point* to determine what kind of *downside protection* the written call provides (Table 2-6). The total return concept of covered writing necessitates viewing both potential income *and* downside protection as important criteria for selecting a writing position. If the stock were held to expiration and the $500 in dividends received, the writer would break even at a price of 39.8. Again, a stock sale commission is not generally included in the break-even point computation, because

the written call would expire totally worthless and the writer might then write another call on the same stock. Later, we discuss the subject of continuing to write against stocks already owned. It will be seen that in many cases, it is advantageous to continue to hold a stock and write against it again, rather than to sell it and establish a covered write in a new stock.

TABLE 2-6.
Downside break-even point—cash account.

Net investment	$20,380
Less dividends	− 500
Total stock cost to expiration	$19,880
Divide by shares held	÷ 500
Break-even price	39.8

Next, we translate the break-even price into *percent downside protection* (Table 2-7), which is a convenient way of comparing the levels of downside protection among variously priced stocks. We will see later that it is actually better to compare the downside protection with the *volatility* of the underlying stock. However, since percent downside protection is a common and widely accepted method that is more readily calculated, it is necessary to be familiar with it as well.

Before moving on to discuss what kinds of returns one should attempt to strive for in which situations, the same example will be worked through again for a covered write in a margin account. The use of margin will provide higher potential returns, since the net investment will be smaller. However, the margin interest charge incurred on the debit balance (the amount of money borrowed from the brokerage firm) will cause the break-even point to be higher, thus slightly reducing the amount of downside protection available from writing the call. Again, all commissions to establish the position are included in the net investment computation.

TABLE 2-7.
Percent downside protection—cash account.

Initial stock price	43
Less break-even price	− 39.8
Points of protection	3.2
Divide by original stock price	÷ 43
Equals percent downside protection	7.4%

Example 2: Recall that the net investment for the cash write was $20,380. A margin covered write requires less than half of the investment of a cash write when the margin rate (set by the Federal Reserve) is 50%. In a margin account, if one desires to remove the premium from the account, he may do so immediately provided that he has enough reserve equity in the account to cover the purchase of the stock. If he does so, his net investment would be equal to the debit balance calculation shown on the right in Table 2-8.

TABLE 2-8.
Net investment required—margin account.

Stock cost	$21,500		
Plus stock commissions	+ 320	Debit balance calculation:	
Net stock cost	$21,820	Net stock cost	$21,820
Times margin rate	× 50%	Less equity	− 10,910
Equity required	$10,910	Debit balance	$10,910
Less premiums received	− 1,500	(at 50% margin)	
Plus option commissions	+ 60		
Net margin investment	$ 9,470		

Tables 2-9 to 2-12 illustrate the computation of returns from writing on margin. If one has already computed the cash returns, he can use method 2 most easily. Method 1 involves no prior profit calculations.

TABLE 2-9.
Return if exercised—margin account.

Method 1		Method 2	
Stock sale proceeds	$22,500	Net profit if exercised—cash	$2,290
Less stock commission	− 330	Less margin interest charges	− 545
Plus dividends	+ 500	Net profit if exercised—margin	$1,745
Less margin interest charges (10% on $10,910 for 6 months)	− 545		
Less debit balance	− 10,910		
Less net margin investment	− 9,470		
Net profit—margin	$ 1,745		

$$\text{Return if exercised} = \frac{\$1{,}745}{\$9{,}470} = 18.4\%$$

TABLE 2-10.
Return if unchanged—margin account.

Method 1		Method 2	
Unchanged stock value (500 shares at 43)	$21,500	Profit if unchanged—cash	$1,620
		Less margin interest charges	– 545
Plus dividends	+ 500	Net profit if unchanged—margin	$1,075
Less margin interest charges (10% on $10,910 debit for 6 months)	– 545		
Less debit balance	– 10,910		
Less net investment (margin)	– 9,470		
Net profit if unchanged—margin	$ 1,075		

$$\text{Return if unchanged} = \frac{\$1{,}075}{\$9{,}470} = 11.4\%$$

TABLE 2-11.
Break-even point—margin write.

Net margin investment	$ 9,470
Plus debit balance	+ 10,910
Less dividends	– 500
Plus margin interest charges	+ 545
Total stock cost to expiration	$20,425
Divide by shares held	÷ 500
Break-even point—margin	40.9

TABLE 2-12.
Percent downside protection—margin write.

Initial stock price	43
Less break-even price—margin	– 40.9
Points of protection	2.1
Divide by original stock price	÷ 43
Equals percent downside protection—margin	4.9%

The return if exercised is 18.4% for the covered write using margin. In Example 1 the return if exercised for a cash write was computed as 11.2%. Thus, the return if exercised from a margin write is considerably higher. In fact, unless a fairly deep in-the-money write is being considered, the return on margin will always be higher than

the return from cash. The farther out-of-the-money that the written call is, the bigger the discrepancy between cash and margin returns will be when the return if exercised is computed.

As with the computation for return if exercised for a write on margin, the return if unchanged calculation is similar for cash and margin also. The only difference is the subtraction of the margin interest charges from the profit. The return if unchanged is also higher for a margin write, provided that there is enough option premium to compensate for the margin interest charges. The return if unchanged in the cash example was 7.9% versus 11.4% for the margin write. In general, the farther from the strike in either direction – out-of-the-money or in-the-money – the less the return if unchanged on margin will exceed the cash return if unchanged. In fact, for deeply out-of-the-money or deeply in-the-money calls, the return if unchanged will be higher on cash than on margin. Table 2-11 shows that the break-even point on margin, 40.9, is higher than the break-even point from a cash write, 39.8, because of the margin interest charges. Again, the percent downside protection can be computed as shown in Table 2-12. Obviously, since the break-even point on margin is higher than that on cash, there is less percent downside protection in a margin covered write.

One other point should be made regarding a covered write on margin: The brokerage firm will loan you only *half of the strike price amount* as a maximum. Thus, it is *not* possible, for example, to buy a stock at 20, sell a deeply in-the-money call struck at 10 points, and trade for free. In that case, the brokerage firm would loan you only 5 – half the amount of the strike.

Even so, it is still possible to create a covered call write on margin that has little or even *zero* margin requirement. For example, suppose a stock is selling at 38 and that a long-term LEAPS option struck at 40 is selling for 19. Then the margin requirement is zero! This does not mean you're getting something for free, however. True, your investment is zero, but your *risk* is still 19 points. Also, your broker would ask for some sort of minimum margin to begin with and would of course ask for maintenance margin if the underlying stock should fall in price. Moreover, you would be paying margin interest all during the life of this long-term LEAPS option position. Leverage can be a good thing or a bad thing, and this strategy has a great deal of leverage. So be careful if you utilize it.

COMPOUND INTEREST

The astute reader will have noticed that our computations of margin interest have been overly simplistic; the compounding effect of interest rates has been ignored. That is, since interest charges are normally applied to an account monthly, the investor will be paying interest in the later stages of a covered writing position not only on the original debit, but on all previous monthly interest charges. This effect is described in detail in a later chapter on arbitrage techniques. Briefly stated, rather

than computing the interest charge as the debit times the interest rate multiplied by the time to expiration, one should technically use:

$$\text{Margin interest charges} = \text{Debit}\ [(1 + r)^t - 1]$$

where r is the interest rate per month and t the number of months to expiration. (It would be incorrect to use days to expiration, since brokerage firms compute interest monthly, not daily.)

In Example 2 of the preceding section, the debit was $10,910, the time was 6 months, and the annual interest rate was 10%. Using this more complex formula, the margin interest charges would be $557, as opposed to the $545 charge computed with the simpler formula. Thus, the difference is usually small, in terms of percentage, and *it is therefore common practice to use the simpler method.*

SIZE OF THE POSITION

So far it has been assumed that the writer was purchasing 500 shares of XYZ and selling 5 calls. This requires a relatively considerable investment for one position for the individual investor. However, one should be aware that buying too few shares for covered writing purposes can lower returns considerably.

Example: If an investor were to buy 100 shares of XYZ at 43 and sell 1 July 45 call for 3, his return if exercised would drop from the 11.2% return (cash) that was computed earlier to a return of 9.9% in a cash account. Table 2-13 verifies this statement.

Since commissions are less, on a per-share basis, when one buys more stock and sells more calls, the returns will naturally be higher with a 500- or 1,000-share position than with a 100- or 200-share position. This difference can be rather dramatic, as Tables 2-14 and 2-15 point out. Several interesting and worthwhile conclusions can be drawn from these tables. The first and most obvious conclusion is that *the more shares*

TABLE 2-13.
Cash investment vs. return.

Net Investment—Cash (100 shares)		Return If Exercised—Cash (100 shares)	
Stock cost	$4,300	Stock sale price	$4,500
Plus commissions	+ 85	Stock commissions	− 85
Less option premium	− 300	Plus dividend	+ 100
Plus option commissions	+ 25	Less net investment	− 4,110
Net investment	$4,110	Net profit if exercised	$ 405

$$\text{Return if exercised} = \frac{\$405}{\$4,110} = 9.9\%$$

one writes against, the higher his returns and the lower his break-even point will be. This is true for both cash and margin and is a direct result of the way commissions are figured: Larger trades involve smaller percentage commission charges. While the percentage returns increase as the number of shares increases for both cash and margin covered writing, the increase is much more dramatic in the case of margin. Note that in Table 2-14, which depicts cash transactions, the return from writing against 100 shares is 9.9% and increases to 12.7% if 2,000 shares are written against. This is an increase, but not a particularly dramatic one. However, in Table 2-15, the return if exercised more than doubles (21.6 vs. 10.4) and the return if unchanged nearly triples (13.0 vs. 4.4) when the 100-share write is compared to the 2,000-share write. This effect is more dramatic for margin writes due to two factors – the lower investment required and the more burdensome effect of margin interest charges on the profits of smaller positions. This effect is so dramatic that a 100-share write in a cash account in our example actually offers a higher return if unchanged than does the margin write – 7.1% vs. 4.4%. This implies that *one should carefully compute his potential returns if he is writing against a small number of shares on margin.*

TABLE 2-14.
Cash covered writes (costs included).

	Shares Written Against						
	100	200	300	400	500	1,000	2,000
Return if exercised (%)	9.9	10.0	10.4	10.8	11.2	12.1	12.7
Return if unchanged (%)	7.1	7.2	7.5	7.7	7.9	8.4	8.7
Break-even point	40.1	40.0	39.9	39.9	39.8	39.6	39.5

TABLE 2-15.
Margin covered writes (costs included).

	Shares Written Against						
	100	200	300	400	500	1,000	2,000
Return if exercised (%)	10.4	15.8	16.6	17.4	18.4	20.4	21.6
Return if unchanged (%)	4.4	9.8	10.3	10.8	11.4	12.3	13.0
Break-even point	41.2	41.1	41.0	41.0	40.9	40.7	40.6

WHAT A DIFFERENCE A DIME MAKES

Another aspect of covered writing that can be important as far as potential returns are concerned is, of course, the prices of the stock and option involved in the write.

It may seem insignificant that one has to pay an extra few cents for the stock or possibly receives a dime or 20 cents less for the call, but even a relatively small fraction can alter the potential returns by a surprising amount. This is especially true for in-the-money writes, although any write will be affected. Let us use the previous 500-share covered writing example, again including all costs.

As before, the results are more dramatic for the margin write than for the cash write. In neither case does the break-even point change by much. However, the potential returns are altered significantly. Notice that if one pays an extra dime for the stock and receives a dime less for the call – the far right-hand column in Table 2-16 – he may greatly negate the effect of writing against a larger number of shares. From Table 2-16, one can see that writing against 300 shares at those prices (43 for the stock and 3 for the call) is approximately the same return as writing against *500 shares* if the stock costs 43⅛ and the option brings in 2⅞.

Table 2-16 should clearly demonstrate that entering a covered writing order *at the market* may not be a prudent thing to do, especially if one's calculations for the potential returns are based on last sales or on closing prices in the newspaper. In the next section, we discuss in depth the proper procedure for entering a covered writing order.

TABLE 2-16.
Effect of stock and option prices on writing returns.

	Buy Stock at 43 Sell Call at 3	Buy Stock at 43.10 Sell Call at 3	Buy Stock at 43.10 Sell Call at 2.90
Return if exercised	11.2% cash	10.9% cash	10.6% cash
	18.4% margin	17.7% margin	16.9% margin
Return if unchanged	7.9% cash	7.6% cash	7.3% cash
	11.4% margin	10.7% margin	9.9% margin
Break-even point	39.8 cash	39.9 cash	40.0 cash
	40.9 margin	41.0 margin	41.1 margin

EXECUTION OF THE COVERED WRITE ORDER

When establishing a covered writing position, the question often arises: Which should be done first – buy the stock or sell the option? The correct answer is that neither should be done first! In fact, *a simultaneous transaction of buying the stock and selling the option is the only way of assuring that both sides of the covered write are established at desired price levels.*

If one "legs" into the position – that is, buys the stock first and then attempts to sell the option, or vice versa – he is subjecting himself to a risk.

Example: An investor wants to buy XYZ at 43 and sell the July 45 call at 3. If he first sells the option at 3 and then tries to buy the stock, he may find that he has to pay more than 43 for the stock. On the other hand, if he tries to buy the stock first and *then* sell the option, he may find that the option price has moved down. In either case the writer will be accepting a lower return on his covered write. Table 2-16 demonstrated how one's returns might be affected if he has to give up an eighth by "legging" into the position.

ESTABLISHING A NET POSITION

What the covered writer really wants to do is ensure that his net price is obtained. If he wants to buy stock at 43 and sell an option at 3, he is attempting to establish the position at 40 *net.* He normally would not mind paying 43.10 for the stock if he can sell the call at 3.10, thereby still obtaining 40 net.

A *"net" covered writing order* must be placed with a brokerage firm because it is essential for the person actually executing the order to have full access to both the stock exchange and the option exchange. This is also referred to as a contingent order. Most major brokerage firms offer this service to their clients, although some place a minimum number of shares on the order. That is, one must write against at least 500 or 1,000 shares in order to avail himself of the service. There are, however, brokerage firms that will take net orders even for 100-share covered writes. Since the chances of giving away a dime are relatively great if one attempts to execute his own order by placing separate orders on two exchanges – stock and option – he should avail himself of the broker's service. Moreover, if his orders are for a small number of shares, he should deal with a broker who will take net orders for small positions.

The reader must understand that *there is no guarantee that a net order will be filled.* The net order is always a "not held" order, meaning that the customer is not guaranteed an execution even if it appears that the order could be filled at prevailing market bids and offers. Of course, the broker will attempt to fill the order if it can reasonably be accomplished, since that is his livelihood. However, if the net order is slightly away from current market prices, the broker may have to "leg" into the position to fill the order. The risk in this is the broker's responsibility, not the customer's. Therefore, the broker may elect not to take the risk and to report "nothing done" – the order is not filled.

If one buys stock at 43 and sells the call at 3, is the return really the same as buying the stock at 43.10 and selling the call at 3.10? The answer is, yes, the returns are

very similar when the prices differ by small amounts. This can be seen without the use of a table. If one pays a dime more for the stock, his investment increases by $10 per 100 shares, or $50 total on a 500-share transaction. However, the fact that he has received an extra dime for the call means that the investment is reduced by $62.50. Thus, there is no effect on the net investment except for commissions. The commission on 500 shares at 43.10 may be slightly higher than the commission for 500 shares at 43. Similarly, the commission on 5 calls at 3.10 may be slightly higher than that on 5 calls at 3. Even so, the increase in commissions would be so small that it would not affect the return by more than one-tenth of 1%.

To carry this concept to extremes may prove somewhat misleading. If one were to buy stock at 40½ and sell the call at ½, he would still be receiving 40 net, but several aspects would have changed considerably. The return if exercised remains amazingly constant, but the return if unchanged and the percentage downside protection are reduced dramatically. If one were to buy stock at 48 and sell the call at 8 – again for 40 net – he would improve the return if unchanged and the percentage downside protection. In reality, when one places a "net" order with a brokerage firm, he normally gets an execution with prices quite close to the ones at the time the order was first entered. It would be a rare case, indeed, when either upside or downside extremes such as those mentioned here would occur in the same trading day.

SELECTING A COVERED WRITING POSITION

The preceding sections, in describing types of covered writes and how to compute returns and break-even points, have laid the groundwork for the ultimate decision that every covered writer must make: choosing which stock to buy and which option to write. This is not necessarily an easy task, because there are large numbers of stocks, striking prices, and expiration dates to choose from.

Since the primary objective of covered writing for most investors is increased income through stock ownership, the return on investment is an important consideration in determining which write to choose. However, the decision must not be made on the basis of return alone. More volatile stocks will offer higher returns, but they may also involve more risk because of their ability to fall in price quickly. Thus, the amount of downside protection is the other important objective of covered writing. Finally, the quality and technical or fundamental outlook of the underlying stock itself are of importance as well. The following section will help to quantify how these factors should be viewed by the covered writer.

PROJECTED RETURNS

The return that one strives for is somewhat a matter of personal preference. In general, *the annualized return if unchanged should be used as the comparative measure between various covered writes.* In using this return as the measuring criterion, one does not make any assumptions about the stock moving up in price in order to attain the potential return. A general rule used in deciding what is a minimally acceptable return is to consider a covered writing position only when the return if unchanged is at least 1% per month. That is, a 3-month write would have to offer a return of at least 3% and a 6-month write would have to have a return if unchanged of at least 6%. During periods of expanded option premiums, there may be so many writes that satisfy this criterion that one would want to raise his sights somewhat, say to 1½% or 2% per month. Also, one must feel personally comfortable that his minimum return criterion – whether it be 1% per month or 2% per month – is large enough to compensate for the risks he is taking. That is, the downside risk of owning stock, should it fall far enough to outdistance the premium received, should be adequately compensated for by the potential return. It should be pointed out that 1% per month is not a return to be taken lightly, especially if there is a reasonable assurance that it can be attained. However, if less risky investments, such as bonds, were yielding 12% annually, the covered writer must set his sights higher.

Normally, the returns from various covered writing situations are compared by annualizing the returns. One should not, however, be deluded into believing that he can always attain the projected annual return. A 6-month write that offers a 6% return annualizes to 12%. But if one establishes such a position, all that he can achieve is 6% in 6 months. One does not really know for sure that 6 months from now there will be another position available that will provide 6% over the next 6 months.

The deeper that the written option is in-the-money, the higher the probability that the return if unchanged will actually be attained. In an in-the-money situation, recall that the return if unchanged is the same as the return if exercised. Both would be attained unless the stock fell below the striking price by expiration. Thus, for an in-the-money write, the projected return is attained if the stock rises, remains unchanged, or even falls slightly by the time the option expires. Higher potential returns are available for out-of-the-money writes if the stock rises. However, should the stock remain the same or decline in price, the out-of-the-money write will generally underperform the in-the-money write. This is why the return if unchanged is a good comparison.

DOWNSIDE PROTECTION

Downside protection is more difficult to quantify than projected returns are. As mentioned earlier, the percentage of downside protection is often used as a measure. This

is somewhat misleading, however, since the more volatile stocks will always offer a large percentage of downside protection (their premiums are higher). The difficulty arises in trying to decide if 10% protection on a volatile stock is better than or worse than, say, 6% protection on a less volatile stock. There are mathematical ways to quantify this, but because of the relatively advanced nature of the computations involved, they are not discussed until later in the text, in Chapter 28 on mathematical applications.

Rather than go into involved mathematical calculations, many covered writers use the percentage of downside protection and will only consider writes that offer a certain minimum level of protection, say 10%. Although this is not exact, it does strive to ensure that one has minimal downside protection in a covered write, as well as an acceptable return. A standard figure that is often used is the 10% level of protection. Alternatively, one may also require that the write be a certain percent in-the-money, say 5%. This is just another way of arriving at the same concept.

THE IMPORTANCE OF STRATEGY

In a conservative option writing strategy, one should be looking for minimum returns if unchanged of 1% per month, with downside protection of at least 10%, as general guidelines. Employing such criteria automatically forces one to write in-the-money options in line with the total return concept. The overall position constructed by using such guidelines as these will be a relatively conservative position – regardless of the volatility of the underlying stock – since the levels of protection will be large but a reasonable return can still be attained. There is a danger, however, in using fixed guidelines, because market conditions change. In the early days of listed options, premiums were so large that virtually every at- or in-the-money covered write satisfied the foregoing criteria. However, now one should work with a ranked list of covered writing positions, or perhaps two lists. A daily computer ranking of either or both of the following categories would help establish the most attractive types of conservative covered writes. One list would rank, by annualized return, the writes that afford, as a minimum, the desired downside protection level, say 10%. The other list would rank, by percentage downside protection, all the writes that meet at least the minimum acceptable return if unchanged, say 12%. If premium levels shrink and the lists become quite small on a daily basis, one might consider expanding the criteria to view more potential situations. On the other hand, if premiums expand dramatically, one might consider using more restrictive criteria, to reduce the number of potential writing candidates.

A different group of covered writers may favor a more aggressive strategy of out-of-the-money writes. *There is some mathematical basis to believe, in the long run, that*

moderately out-of-the-money covered writes will perform better than in-the-money writes. In falling or static markets, any covered writer, even the more aggressive one, will outperform the stockowner who does not write calls. The out-of-the-money covered writer has more risk in such a market than the in-the-money writer does. But in a rising market, the out-of-the-money covered writer will not limit his returns as much as the in-the-money writer will. As stated earlier, the out-of-the-money writer's performance will more closely follow the performance of the underlying stock; that is, it will be more volatile on a quarter-by-quarter basis.

There is merit in either philosophy. The in-the-money writes appeal to those investors looking to earn a relatively consistent, moderate rate of return. This is the *total return concept.* These investors are generally concerned with preservation of capital, thus striving for the greater levels of downside protection available from in-the-money writes. On the other hand, some investors prefer to strive for higher potential returns through writing out-of-the-money calls. These more aggressive investors are willing to accept more downside risk in their covered writing positions in exchange for the possibility of higher returns should the underlying stock rise in price. These investors often rely on a bullish research opinion on a stock in order to select out-of-the-money writes.

Although the type of covered writing strategy pursued is a matter of personal philosophy, it would seem that the benefits of in-the-money strategy – more consistent returns and lessened risk than stock ownership will normally provide – would lead the portfolio manager or less aggressive investor toward this strategy. If the investor is interested in achieving higher returns, some of the strategies to be presented later in the book may be able to provide higher returns with less risk than can out-of-the-money covered writing.

The final important consideration in selecting a covered write is the underlying stock itself. One does not necessarily have to be bullish on the underlying stock to take a covered writing position. As long as one does not foresee a potential decline in the underlying stock, he can feel free to establish the covered writing position. It is generally best if one is neutral or slightly bullish on the underlying stock. *If one is bearish, he should not take a covered writing position on that stock,* regardless of the levels of protection that can be obtained. An even broader statement is that one should not establish a covered write on a stock that he does not want to own. Some individual investors may have qualms about buying stock they feel is too volatile for them. Impartially, if the return and protection are adequate, the characteristics of the total position are different from those of the underlying stock. However, it is still true that one should not invest in positions that he considers too risky for his portfolio, nor should one establish a covered write just because he likes a particular stock. If the

potential return is unchanged or levels of downside protection do not meet one's criteria, the write should not be established.

The covered writing *strategist* strives for a balance between acceptable returns and downside protection. He rejects situations that do not meet his criteria in either category and rejects stocks on which he is bearish. The resulting situations will probably fulfill the objectives of a conservative covered writing program: increased income, protection, and less variability of results on a less volatile investment portfolio.

WRITING AGAINST STOCK ALREADY OWNED

Establishing covered writing positions against stock that has previously been purchased involves other factors. It is often the case that an investor owns stock that has listed options trading, but feels that the returns from writing are too low in comparison to other covered writes that simultaneously exist in the marketplace. This opinion may be valid, but often arises from the fact that the investor has seen a computer-generated list showing returns on his stock as being low in comparison to similarly priced stocks. One should note that such lists generally assume that stock is bought in order to establish the covered write; the returns are usually not computed and published for writing against stock already held. It may be the case that the commission costs for selling one stock and investing in another may alter the returns so substantially that one would be better off to write against the shares of stock initially held.

Example: An investor owns XYZ stock and is comparing it against AAA stock for writing purposes. If AAA is more volatile than XYZ, the current prices might appear as follows:

Stock	Oct 50 Call
XYZ: 50	4
AAA: 50	6

Table 2-17 summarizes the computation of the return if exercised as one might see it listed on a daily or weekly summary of available covered writing returns. Assume that 500 shares are being written against, that XYZ will pay 50 cents per share in dividends while AAA pays none during the life of the call, and that the October 50 is a 6-month call.

Without going into as much detail, the other significant aspects of these two writes are:

	XYZ	AAA
Return if exercised – margin	7.9%	16.2%
Downside break-even point – cash	46.3	44.9
Downside break-even point – margin	47.6	46.1

Seeing these calculations, the XYZ stockholder may feel that it is not advisable to write against his stock, or he may even be tempted to sell XYZ and buy AAA in order to establish a covered write. Either of these actions could be a mistake.

First, he should compute what his returns would be, at current prices, from writing against the XYZ *he already owns*. Since the stock is already held, no stock buy commissions would be involved. This would reduce the net investment shown below by the stock purchase commissions, or $345, giving a total net investment (cash) of $23,077. In theory, the stockholder does not really make an investment per se; after all, he already owns the stock. However, for the purposes of computing returns, an investment figure is necessary. This reduction in the net investment will increase his profit by the same amount – $345 – thus, bringing the profit up to $1,828. Consequently, the return if exercised (cash) would be 7.9% on XYZ stock already held. On margin, the return would increase to 11.3% after eliminating purchase commissions. This return, assumed to be for a 6-month period, is well in excess of 1% per

TABLE 2-17.
Summary of covered writing returns, XYZ and AAA.

	XYZ	AAA
Buy 500 shares at 50	$25,000	$25,000
Plus stock commissions	+ 345	+ 345
Less option premiums received	– 2,000	– 3,000
Plus option sale commissions	+ 77	+ 91
Net investment—cash	$23,422	$22,436
Sell 500 shares at 50	$25,000	$25,000
Less stock sale commissions	– 345	– 345
Dividend received	+ 250	0
Less net investment	– 23,422	– 22,436
Net profit	$ 1,483	$ 2,219
Return if exercised—cash	6.3%	9.9%

month, the level nominally used for acceptable covered writes. Thus, the investor who already owns stock may inadvertently be overlooking a potentially attractive covered write because he has not computed the returns excluding the stock purchase commission on his current stock holding.

It could conceivably be an even more extreme oversight for the investor to switch from XYZ to AAA for writing purposes. The investor may consider making this switch because he thinks that he could substantially increase his return, from 6.3% to 9.9% for the 6-month period, as shown in Table 2-17 comparing the two writes.

However, the returns are not truly comparable because the investor already owns XYZ. To make the switch, he would first have to spend $345 in stock commissions to sell his XYZ, thereby reducing his profits on AAA by $345. Referring again to the preceding detailed breakdown of the return if exercised, the profit on AAA would then decline to $1,874 on the investment of $22,436, a return if exercised (cash) of 8.4%. On margin, the comparable return from switching stocks would drop to 14.8%.

The real comparison in returns from writing against these two stocks should be made in the following manner. The return from writing against XYZ *that is already held* should be compared with the return from writing against AAA *after switching from XYZ:*

	XYZ Already Held	Switch from XYZ to AAA
Return if exercised – cash	7.9%	8.4%
Return if exercised – margin	11.3%	14.8%

Each investor must decide for himself whether it is worth this *much smaller increase* in return to switch to a more volatile stock that pays a smaller dividend. He can, of course, only make this decision by making the true comparison shown immediately above as opposed to the first comparison, which assumed that both stocks had to be purchased in order to establish the covered write.

The same logic applies in situations in which an investor has been doing covered writing. If he owns stock on which an option has expired, he will have to decide whether to write against the same stock again or to sell the stock and buy a new stock for covered writing purposes. Generally, the investor should write against the stock already held. This justifies the method of computation of return if unchanged for out-of-the-money writes and also the computation of downside break-even points in which a stock sale commission was not charged. That is, the writer would not normally sell his stock after an option has expired worthless, but would instead write another option against the same stock. It is thus acceptable to make these computations without including a stock sales commission.

A WORD OF CAUTION

The stockholder who owns stock from a previous purchase and later contemplates writing calls against that stock must be aware of his situation. He must realize and accept the fact that he might lose his stock via assignment. If he is determined to retain ownership of the stock, he may have to buy back the written option at a loss should the underlying stock increase in price. In essence, he is limiting the stock's upside potential. If a stockholder is going to be frustrated and disappointed when he is not fully participating during a rally in his stock, he should not write a call in the first place. Perhaps he could utilize the incremental return concept of covered writing, a topic covered later in this chapter.

As stressed earlier, a covered writing strategy involves viewing the stock and option as a *total* position. *It is not a strategy wherein the investor is a stockholder who also trades options against his stock position.* If the stockholder is selling the calls because he thinks the stock is going to decline in price and the call trade itself will be profitable, he may be putting himself in a tenuous position. Thinking this way, he will probably be satisfied only if he makes a profit on the call trade, regardless of the unrealized result in the underlying stock. This sort of philosophy is contrary to a covered writing strategy philosophy. Such an investor – he is really becoming a trader – should carefully review his motives for writing the call and anticipate his reaction if the stock rises substantially in price after the call has been written.

In essence, *writing calls against stock that you have no intention of selling is tantamount to writing naked calls!* If one is going to be extremely frustrated, perhaps even experiencing sleepless nights, if his stock rises above the strike price of the call that he has written, then he is experiencing trials and tribulations much as the writer of a naked call would if the same stock move occurred. This is an unacceptable level of emotional worry for a true covered writing strategist.

Think about it. If you have some very low-cost-basis stock that you don't really want to sell, and then you sell covered calls against that stock, what do you wish will happen? Most certainly you wish that the options will expire worthless (i.e., that the stock won't get called away) – exactly what a naked writer wishes for.

The problems can be compounded if the stock rises, and one then decides to roll these calls. Rather than spend a small debit to close out a losing position, an investor may attempt to roll to more distant expiration months and higher strike prices in order to keep bringing in credits. Eventually, he runs out of room as the lower strikes disappear, and he has to either sell some stock or pay a *big* debit to buy back the written calls. So, if the underlying stock continues to run higher, the writer suffers emotional devastation as he attempts to "fight the market." There have been some classic cases of Murphy's law whereby people have covered the calls at a big

debit rather than let their "untouchable" stock be called away, just before the stock itself or the stock market collapsed.

One should be very cautious about writing covered calls against stocks that he doesn't intend to sell. If one feels that he cannot sell his stock, for whatever reason – tax considerations, emotional ties, etc. – he really should *not* sell covered calls against it. Perhaps buying a protective put (discussed in a later chapter) would be a better strategy for such a stockholder.

DIVERSIFYING RETURN AND PROTECTION IN A COVERED WRITE

FUNDAMENTAL DIVERSIFICATION TECHNIQUES

Quite clearly, the covered writing strategist would like to have as much of a combination of high potential returns and adequate downside protection as he can obtain. Writing an out-of-the-money call will offer higher returns if exercised, but it usually affords only a modest amount of downside protection. On the other hand, writing an in-the-money call will provide more downside cushion but offers a lower return if exercised. For some strategists, this diversification is realized in practice by writing out-of-the-money calls on some stocks and in-the-moneys on other stocks. There is no guarantee that writing in this manner on a list of diversified stocks will produce superior results. One is still forced to pick the stocks that he expects will perform better (for out-of-the-money writing), and that is difficult to do. Moreover, the individual investor may not have enough funds available to diversify into many such situations. There is, however, another alternative to obtaining diversification of both returns and downside protection in a covered writing situation.

The writer may often do best by writing half of his position against in-the-moneys and half against out-of-the-moneys on the same stock. This is especially attractive for a stock whose out-of-the-money calls do not appear to provide enough downside protection, and at the same time, whose in-the-money calls do not provide quite enough return. By writing both options, the writer may be able to acquire the return and protection diversification that he is seeking.

Example: The following prices exist for 6-month calls:

XYZ common stock, 42;
XYZ April 40 call, 4; and
XYZ April 45 call, 2.

The writer wishing to establish a covered write against XYZ common stock may like the protection afforded by the April 40 call, but may not find the return particularly attractive. He may be able to improve his return by writing April 45's against part of his position. Assume the writer is considering buying 1,000 shares of XYZ. Table 2-18 compares the attributes of writing the out-of-the-money (April 45) only, or of writing only the in-the-money (April 40), or of writing 5 of each. The table is based on a cash covered write, but returns and protection would be similar for a margin write. Commissions are included in the figures.

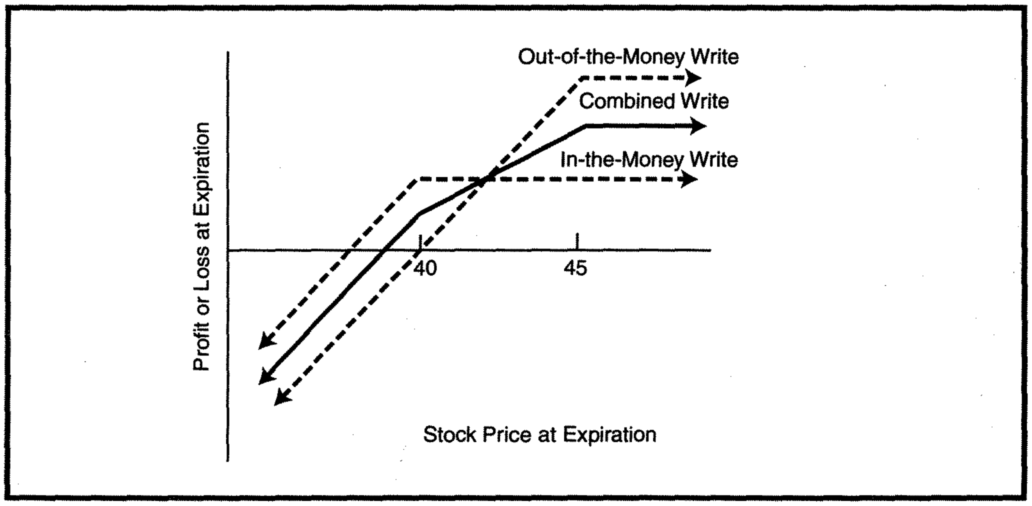
It is easily seen that the *"combined" write* – half of the position against the April 40's and the other half against the April 45's – offers the best balance of return and protection. The in-the-money call, by itself, provides over 10% downside protection, but the 5% return if exercised is less than 1% per month. Thus, one might not want to write April 40's against his entire position, because the potential return is small. At the same time, the April 45's, if written against the entire stock position, would provide for an attractive return if exercised (over 2% per month) but offer only 5% downside protection. The combined write, which has the better features of both options, offers over 8% return if exercised (1⅓% per month) and affords over 8% downside protection. By writing both calls, the writer has potentially solved the problems inherent in writing entirely out-of-the-moneys or entirely in-the-moneys. The "combined" write frees the covered writer from having to initially take a bearish (in-the-money write) or bullish (out-of-the-money write) posture on the stock if he does not want to. This is often necessary on a low-volatility stock trading between striking prices.

TABLE 2-18.
Attributes of various writes.

	In-the-Money Write	Out-of-the-Money Write	Write Both Calls
Buy 1,000 XYZ and sell	10 April 40's	10 April 45's	5 April 40's and 5 April 45's
Return if exercised	5.1%	12.2%	8.4%
Return if unchanged	5.1%	6.0%	5.4%
Percent protection	10.5%	5.7%	8.1%

For those who prefer a graphic representation, the profit graph shown in Figure 2-2 compares the combined write of both calls with either the in-the-money write or the out-of-the-money write (dashed lines). It can be observed that all three choices are equal if XYZ is near 42 at expiration; all three lines intersect there.

FIGURE 2-2.
Comparison: combined write vs. in-the-money write and out-of-the-money write.



Since this technique can be useful in providing diversification between protection and return, not only for an individual position but for a large part of a portfolio, it may be useful to see exactly how to compute the potential returns and break-even points. Tables 2-19 and 2-20 calculate the return if exercised and the return if unchanged using the prices from the previous example. Assume XYZ will pay $1 per share in dividends before April expiration.

Note that the profit calculations are similar to those described in earlier sections, except that now there are two prices for stock sales since there are two options involved. In the "return if exercised" section, half of the stock is sold at 45 and half is sold at 40. The "return if unchanged" calculation is somewhat more complicated now,

TABLE 2-19.
Net investment—cash account.

Buy 1,000 XYZ at 42	$42,000
Plus stock commissions	+ 460
Less options premiums:	
Sell 5 April 40's at 4	– 2,000
Sell 5 April 45's at 2	– 1,000
Plus total option commissions	+ 140
Net investment	$39,600

TABLE 2-20.
Net return—cash account.

Return If Exercised		Return If Unchanged	
Sell 500 XYZ at 45	$22,500	Unchanged stock value (500 shares at 42)	$21,000
Sell 500 XYZ at 40	20,000	Sell 500 at 40	+ 20,000
Less total stock sale commissions	– 560	Commissions on sale at 40	– 280
Plus dividends ($1/share)	+ 1,000	Plus dividends ($1/share)	+ 1,000
Less net investment	– 39,600	Less net investment	– 39,600
Net profit if exercised	$ 3,340	Net profit if unchanged	$ 2,120

Return if exercised (cash) $= \frac{3{,}340}{39{,}600} = 8.4\%$

Return if unchanged (cash) $= \frac{2{,}120}{39{,}600} = 5.4\%$

because half of the stock will be called away if it remains unchanged (the in-the-money portion) whereas the other half will not. This is consistent with the method of calculating the return if unchanged that was introduced previously.

The break-even point is calculated as before. The "total stock cost to expiration" would be the net investment of $39,600 less the $1,000 received in dividends. This is a total of $38,600. On a per-share basis, then, the break-even point of 38.6 is 8.1% below the current stock price of 42. Thus, the amount of percentage downside protection is 8.1%.

The foregoing calculations clearly demonstrate that the returns on the "combined" write are *not* exactly the averages of the in-the-money and out-of-the-money returns, because of the different commission calculations at various stock prices. However, if one is working with a computer-generated list and does not want to bother to calculate exactly the return on the combined write, he can arrive at a relatively close approximation by averaging the returns for the in-the-money write and the out-of-the-money write.

OTHER DIVERSIFICATION TECHNIQUES

Holders of large positions in a particular stock may want even more diversification than can be provided by writing against two different striking prices. Institutions, pension funds, and large individual stockholders may fall into this category. It is often advisable for such large stockholders to *diversify* their writing *over time* as well as over at least two striking prices. By diversifying over time – for example, writing one-

third of the position against near-term calls, one-third against middle-term calls, and the remaining third against long-term calls – one can gain several benefits. First, all of one's positions need not be adjusted at the same time. This includes either having the stock called away or buying back one written call and selling another. Moreover, one is not subject only to the level of option premiums that exist at the time one series of calls expires. For example, if one writes only 9-month calls and then rolls them over when they expire, he may unnecessarily be subjecting himself to the potential of lower returns. If option premium levels happen to be low when it is time for this 9-month call writer to sell more calls, he will be establishing a less-than-optimum write for up to 9 months. By spreading his writing out over time, he would, at worst, be subjecting only one-third of his holding to the low-premium write. Hopefully, premiums would expand before the next expiration 3 months later, and he would then be getting a relatively better premium on the next third of his portfolio. There is an important aside here: The individual or relatively small investor who owns only enough stock to write one series of options should generally not write the longest-term calls for this very reason. He may not be obtaining a particularly attractive level of premiums, but may feel he is forced to retain the position until expiration. Thus, he could be in a relatively poor write for as long as 9 months. Finally, this type of diversification may also lead to having calls at various striking prices as the market fluctuates cyclically. All of one's stock is not necessarily committed at one price if this diversification technique is employed.

This concludes the discussion of how to establish a covered writing position against stock. Covered writes against other types of securities are described later.

FOLLOW-UP ACTION

Establishing a covered write, or any option position for that matter, is only part of the strategist's job. Once the position has been taken, it must be monitored closely so that adjustments may be made should the stock drop too far in price. Moreover, even if the stock remains relatively unchanged, adjustments will need to be made as the written call approaches expiration.

Some writers take no follow-up action at all, preferring to let a stock be called away if it rises above the striking price at the expiration of the option, or preferring to let the original expire worthless if the stock is below the strike. These are not always optimum actions; there may be much more decision making involved.

Follow-up action can be divided into three general categories:

1. protective action to take if the stock drops,
2. aggressive action to take when the stock rises, or
3. action to avoid assignment if the time premium disappears from an in-the-money call.

There may be times when one decides to close the entire position before expiration or to let the stock be called away. These cases are discussed as well.

PROTECTIVE ACTION IF THE UNDERLYING STOCK DECLINES IN PRICE

The covered writer who does not take protective action in the face of a relatively substantial drop in price by the underlying stock may be risking the possibility of large losses. Since covered writing is a strategy with limited profit potential, one should also take care to limit losses. Otherwise, one losing position can negate several winning positions. The simplest form of follow-up action in a decline is to merely close out the position. This might be done if the stock declines by a certain percentage, or if the stock falls below a technical support level. Unfortunately, this method of defensive action may prove to be an inferior one. The investor will often do better to continue to sell more time value in the form of additional option premiums.

Follow-up action is generally taken by buying back the call that was originally written and then writing another call, with a different striking price and/or expiration date, in its place. Any adjustment of this sort is referred to as a *rolling action.* When the underlying stock drops in price, one generally buys back the original call – presumably at a profit since the underlying stock has declined – and then sells a call with a lower striking price. This is known as *rolling down,* since the new option has a lower striking price.

Example: The covered writing position described as "buy XYZ at 51, sell the XYZ January 50 call at 6" would have a maximum profit potential at expiration of 5 points. Downside protection is 6 points down to a stock price of 45 at expiration. These figures do not include commissions, but for the purposes of an elementary example, the commissions will be ignored.

If the stock begins to decline in price, taking perhaps two months to fall to 45, the following option prices might exist:

XYZ common, 45;

XYZ January 50 call, 1; and

XYZ January 45 call, 4.

The covered writer of the January 50 would, at this time, have a small unrealized loss of one point in his overall position: His loss on the common stock is 6 points, but he has a 5-point gain in the January 50 call. (This demonstrates that *prior to expiration,* a loss occurs at the "break-even" point.) If the stock should continue to fall from these levels, he could have a larger loss at expiration. The call, selling for one point, only affords one more point of downside protection. If a further stock price drop is anticipated, *additional downside protection can be obtained by rolling down.* In this example, if one were to buy back the January 50 call at 1 and sell the January 45 at 4, he would be rolling down. This would increase his protection by another three points – the credit generated by buying the 50 call at 1 and selling the 45 call at 4. Hence, his downside break-even point would be 42 after rolling down.

Moreover, if the stock were to remain unchanged – that is, if XYZ were exactly 45 at January expiration – the writer would make an *additional* $300. If he had not rolled down, the most *additional* income that he could make, if XYZ remained unchanged, would be the remaining $100 from the January 50 call. So *rolling down gives more downside protection against a further drop in stock price and may also produce additional income if the stock price stabilizes.*

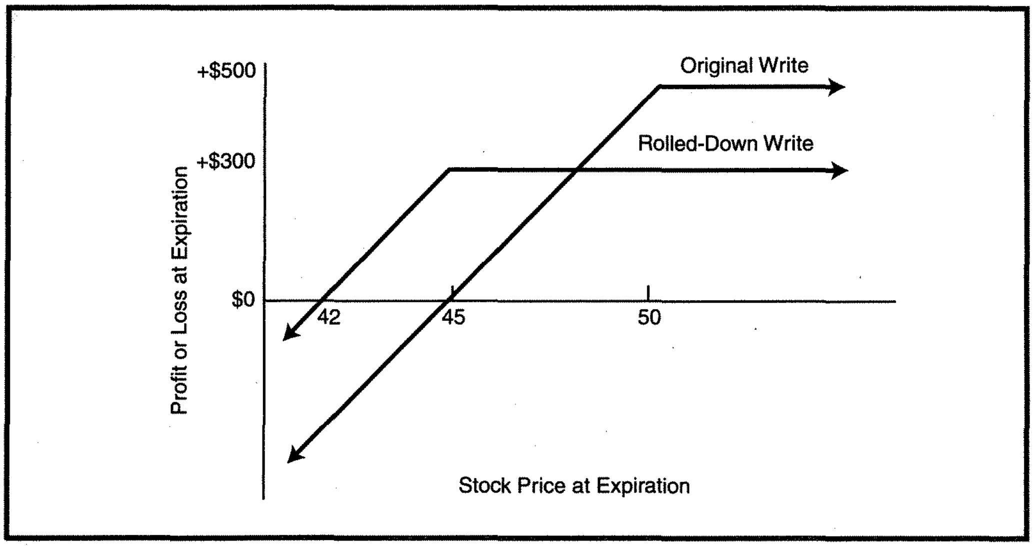
In order to more exactly evaluate the overall effect that was obtained by rolling down in this example, one can either compute a profit table (Table 2-21) or draw a net profit graph (Figure 2-3) that compares the original covered write with the rolled-down position.

Note that the rolled-down position has a smaller maximum profit potential than the original position did. This is because, by rolling down to a January 45 call, the writer limits his profits anywhere above 45 at expiration. He has committed himself to sell stock 5 points lower than the original position, which utilized a January 50 call and thus had limited profits above 50. *Rolling down generally reduces the maximum*

TABLE 2-21.
Profit table.

XYZ Price at Expiration	Profit from January 50 Write	Profit from Rolled Position
40	–$500	–200
42	– 300	0
45	0	+300
48	+ 300	+300
50	+ 500	+300
60	+ 500	+300

FIGURE 2-3.
Comparison: original covered write vs. rolled-down write.



profit potential of the covered write. Limiting the maximum profit may be a secondary consideration, however, when a stock is breaking downward. Additional downside protection is often a more pressing criterion in that case.

Anywhere below 45 at expiration, the rolled-down position does $300 better than the original position, because of the $300 credit generated from rolling down. In fact, the rolled-down position will outperform the original position even if the stock rallies back to, but not above, a price of 48. At 48 at expiration, the two positions are equal, both producing a $300 profit. If the stock should reverse direction and rally back above 48 by expiration, the writer would have been better off not to have rolled down. All these facts are clear from Table 2-21 and Figure 2-3.

Consequently, the only case in which it does not pay to roll down is the one in which the stock experiences a reversal – a rise in price after the initial drop. The selection of where to roll down is important, because rolling down too early or at an inappropriate price could limit the returns. Technical support levels of the stock are often useful in selecting prices at which to roll down. If one rolls down after technical support has been broken, the chances of being caught in a stock-price-reversal situation would normally be reduced.

The above example is rather simplistic; in actual practice, more complicated situations may arise, such as a sudden and fairly steep decline in price by the underlying stock. This may present the writer with what is called a *locked-in loss.* This means, simply, that there is no option to which the writer can roll down that will provide him

with enough premium to realize any profit if the stock were then called away at expiration. These situations arise more commonly on lower-priced stocks, where the striking prices are relatively far apart in percentage terms. Out-of-the-money writes are more susceptible to this problem than are in-the-money writes. Although it is not emotionally satisfying to be in an investment position that cannot produce a profit – at least for a limited period of time – it may still be beneficial to roll down to protect as much of the stock price decline as possible.

Example: For the covered write described as "buy XYZ at 20, sell the January 20 call at 2," the stock unexpectedly drops very quickly to 16, and the following prices exist:

XYZ common, 16;

XYZ January 20 call, ½; and

XYZ January 15 call, 2½.

The covered writer is faced with a difficult choice. He currently has an unrealized loss of 2½ points – a 4-point loss on the stock which is partially offset by a 1½-point gain on the January 20 call. This represents a fairly substantial percentage loss on his investment in a short period of time. He could do nothing, hoping for the stock to recover its loss. Unfortunately, this may prove to be wishful thinking.

If he considers rolling down, he will not be excited by what he sees. Suppose that the writer wants to roll down from the January 20 to the January 15. He would thus buy the January 20 at ½ and sell the January 15 at 2½, for a net credit of 2 points. By rolling down, he is obligating himself to sell his stock at 15, the striking price of the January 15 call. Suppose XYZ were above 15 in January and were called away. How would the writer do? He would lose 5 points on his stock, since he originally bought it at 20 and is selling it at 15. This 5-point loss is substantially offset by his option profits, which amount to 4 points: 1½ points of profit on the January 20, sold at 2 and bought back at ½, plus the 2½ points received from the sale of the January 15. However, his net result is a 1-point loss, since he lost 5 points on the stock and made only 4 points on the options. Moreover, this 1-point loss is the best that he can hope for! This is true because, as has been demonstrated several times, a covered writing position makes its maximum profit anywhere above the striking price. Thus, by rolling down to the 15 strike, he has limited the position severely, to the extent of "locking in a loss."

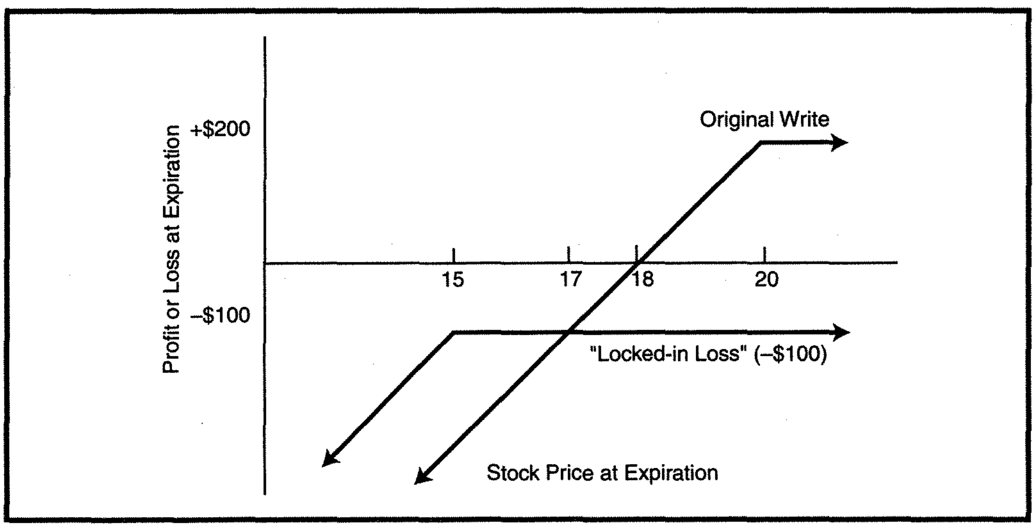
Even considering what has been shown about this loss, *it is still correct for this writer to roll down to the January 15.* Once the stock has fallen to 16, there is nothing anybody can do about the unrealized losses. However, if the writer rolls down, he can prevent the losses from accumulating at a faster rate. In fact, he will do better by

rolling down if the stock drops further, remains unchanged, or even rises slightly. Table 2-22 and Figure 2-4 compare the original write with the rolled-down position. It is clear from the figure that the rolled-down position is locked into a loss. However, the rolled-down position still outperforms the original position unless the stock rallies back above 17 by expiration. Thus, if the stock continues to fall, if it remains unchanged, or even if it rallies less than 1 point, the rolled-down position actually outperforms the original write. It is for this reason that the writer is taking the most logical action by rolling down, even though to do so locks in a loss.

TABLE 2-22.
Profits of original write and rolled position.

Stock Price at Expiration	Profit from January 20 Write	Profit from Rolled Position
10	–$800	–$600
15	– 300	– 100
18	0	– 100
20	+ 200	– 100
25	+ 200	– 100

FIGURE 2-4.
Comparison: original write vs. "locked-in loss."



Technical analysis may be able to provide a little help for the writer faced with the dilemma of rolling down to lock in a loss or else holding onto a position that has no further downside protection. If XYZ has broken a support level or important trend line, it is added evidence for rolling down. In our example, it is difficult to imagine the case in which a $20 stock suddenly drops to become a $16 stock without substantial harm to its technical picture. Nevertheless, if the charts should show that there is support at 15½ or 16, it may be worth the writer's while to wait and see if that support level can hold before rolling down.

Perhaps the best way to avoid having to lock in losses would be to establish positions that are less likely to become such a problem. In-the-money covered writes on higher-priced stocks that have a moderate amount of volatility will rarely force the writer to lock in a loss by rolling down. Of course, any stock, should it fall far enough and fast enough, could force the writer to lock in a loss if he has to roll down two or three times in a fairly short time span. However, the higher-priced stock has striking prices that are much closer together (in percentages); it thus presents the writer with the opportunity to utilize a new option with a lower striking price much sooner in the decline of the stock. Also, higher volatility should help in generating large enough premiums that substantial portions of the stock's decline can be hedged by rolling down. Conversely, low-priced stocks, especially nonvolatile ones, often present the most severe problems for the covered writer when they decline in price.

A related point concerning order entry can be inserted here. When one simultaneously buys one call and sells another, he is executing a spread. Spreads in general are discussed at length later. However, the covered writer should be aware that whenever he rolls his position, the order can be placed as a spread order. This will normally help the writer to obtain a better price execution.

AN ALTERNATIVE METHOD OF ROLLING DOWN

There is another alternative that the covered writer can use to attempt to gain some additional downside protection without necessarily having to lock in a loss. Basically, the writer rolls down only part of his covered writing position.

Example: One thousand shares of XYZ were bought at 20 and 10 January 20 calls were sold at 2 points each. As before, the stock falls to 16, with the following prices: XYZ January 20 call, ½; and XYZ January 15 call, 2½. As was demonstrated in the last section, if the writer were to roll all 10 calls down from the January 20 to the January 15, he would be locking in a loss. Although there may be some justification for this action, the writer would naturally rather not have to place himself in such a position.

One can attempt to achieve some balance between added downside protection and upward profit potential by rolling down only part of the calls. In this example,

the writer would buy back only 5 of the January 20's and sell 5 January 15 calls. He would then have this position:

long 1,000 XYZ at 20;

short 5 XYZ January 20's at 2;

short 5 XYZ January 15's at 2½; and

realized gain, $750 from 5 January 20's.

This strategy is generally referred to a *partial roll-down,* in which only a portion of the original calls is rolled, as opposed to the more conventional complete roll-down. Analyzing the partially rolled position makes it clear that the writer no longer locks in a loss.

If XYZ rallies back above 20, the writer would, at expiration, sell 500 XYZ at 20 (breaking even) and 500 at 15 (losing $2,500 on this portion). He would make $1,000 from the five January 20's held until expiration, plus $1,250 from the five January 15's, plus the $750 of realized gain from the January 20's that were rolled down. This amounts to $3,000 worth of option profits and $2,500 worth of stock losses, or an overall net gain of $500, less commissions. Thus, the partial roll-down offers the writer a chance to make some profit if the stock rebounds. Obviously, the partial roll-down will not provide as much downside protection as the complete roll-down does, but it does give more protection than not rolling down at all. To see this, compare the results given in Table 2-23 if XYZ is at 15 at expiration.

TABLE 2-23.
Stock at 15 at expiration.

Strategy	Stock Loss	Option Profit	Total Loss
Original position	–$5,000	+$2,000	–$3,000
Partial roll-down	– 5,000	+ 3,000	– 2,000
Complete roll-down	– 5,000	+ 4,000	– 1,000

In summary, the covered writer who would like to roll down, but who does not want to lock in a loss or who feels the stock may rebound somewhat before expiration, should consider rolling down only part of his position. If the stock should continue to drop, making it evident that there is little hope of a strong rebound back to the original strike, the rest of the position can then be rolled down as well.

UTILIZING DIFFERENT EXPIRATION SERIES WHEN ROLLING DOWN

In the examples thus far, the same expiration month has been used whenever rolling-down action was taken. In actual practice, the writer may often want to use a more distant expiration month when rolling down and, in some cases, he may even want to use a nearer expiration month.

The advantage of rolling down into a more distant expiration series is that more actual points of protection are received. This is a common action to take when the underlying stock has become somewhat worrisome on a technical or fundamental basis. However, since rolling down reduces the maximum profit potential – a fact that has been demonstrated several times – every roll-down should not be made to a more distant expiration series. By utilizing a longer-term call when rolling down, one is reducing his maximum profit potential for a longer period of time. Thus, the longer-term call should be used only if the writer has grown concerned over the stock's capability to hold current price levels. The partial roll-down strategy is particularly amenable to rolling down to a longer-term call since, by rolling down only part of the position, one has already left the door open for profits if the stock should rebound. Therefore, he can feel free to avail himself of the maximum protection possible in the part of his position that is rolled down.

The writer who must roll down to lock in a loss, possibly because of circumstances beyond his control, such as a sudden fall in the price of the underlying stock, may actually want to roll down to a near-term option. This allows him to make back the available time premium in the short-term call in the least time possible.

Example: A writer buys XYZ at 19 and sells a 6-month call for 2 points. Shortly thereafter, however, bad news appears concerning the common stock and XYZ falls quickly to 14. At that time, the following prices exist for the calls with the striking price 15:

XYZ common, 14:
near-term call, 1;
middle-term call, $1\frac{1}{2}$; and
far-term call, 2.

If the writer rolls down into any of these three calls, he will be locking in a loss. Therefore, the best strategy may be to roll down into the near-term call, planning to capture one point of time premium in 3 months. In this way, he will be beginning to work himself out of the loss situation by availing himself of the most potential time premium decay in the shortest period of time. When the near-term call expires 3 months from now, he can reassess the situation to decide if he wants to write

another near-term call to continue taking in short-term premiums, or perhaps write a long-term call at that time.

When rolling down into the near-term call, one is attempting to return to a potentially profitable situation in the shortest period of time. By writing short-term calls one or two times, the writer will eventually be able to reduce his stock cost nearer to 15 in the shortest time period. Once his stock cost approaches 15, he can then write a long-term call with striking price 15 and return again to a potentially profitable situation. He will no longer be locked into a loss.

ACTION TO TAKE IF THE STOCK RISES

A more pleasant situation for the covered writer to encounter is the one in which the underlying stock rises in price after the covered writing position has been established. There are generally several choices available if this happens. The writer may decide to do nothing and to let his stock be called away, thereby making the return that he had hoped for when he established the position. On the other hand, if the underlying stock rises fairly quickly and the written call comes to parity, the writer may either close the position early or roll the call up. Each case is discussed.

Example: Someone establishes a covered writing position by buying a stock at 50 and selling a 6-month call for 6 points. His maximum profit potential is 6 points anywhere above 50 at expiration, and his downside break-even point is 44. Furthermore, suppose that the stock experiences a substantial rally and that it climbs to a price of 60 in a short period of time. With the stock at 60, the July 50 might be selling for 11 points and a July 60 might sell for as much as 7 points. Thus, the writer may consider buying back the call that was originally written and rolling up to the call with a higher striking price. Table 2-24 summarizes the situation.

TABLE 2-24.
Comparison of original and current prices.

Original Position	Current Prices	
Buy XYZ at 50	XYZ common	60
Sell XYZ July 50 call at 6	XYZ July 50	11
	XYZ July 60	7

If the writer were to *roll-up* – that is, buy back the July 50 and sell the July 60 – he would be increasing his profit potential. If XYZ were above 60 in July and were called away, he would make his option credits – 6 points from the July 50 plus 7

points from the July 60 – less the 11 points he paid to buy back the July 50. Thus, his option profits would amount to 2 points, which, added to the stock profit of 10 points, increases his maximum profit potential to 12 points anywhere above 60 at July expiration.

To increase his profit potential by such a large amount, the covered writer has given up some of his downside protection. *The downside break-even point is always raised by the amount of the debit required to roll up.* The debit required to roll up in this example is 4 points – buy the July 50 at 11 and sell the July 60 at 7. Thus, the break-even point is increased from the original 44 level to 48 after rolling up. There is another method of calculating the new profit potential and break-even point. In essence, the writer has raised his net stock cost to 55 by taking the realized 5-point loss on the July 50 call. Hence, he is essentially in a covered write whereby he has bought stock at 55 and has sold a July 60 call for 7. When expressed in this manner, it may be easier to see that the break-even point is 48 and the maximum profit potential, above 60, is 12 points.

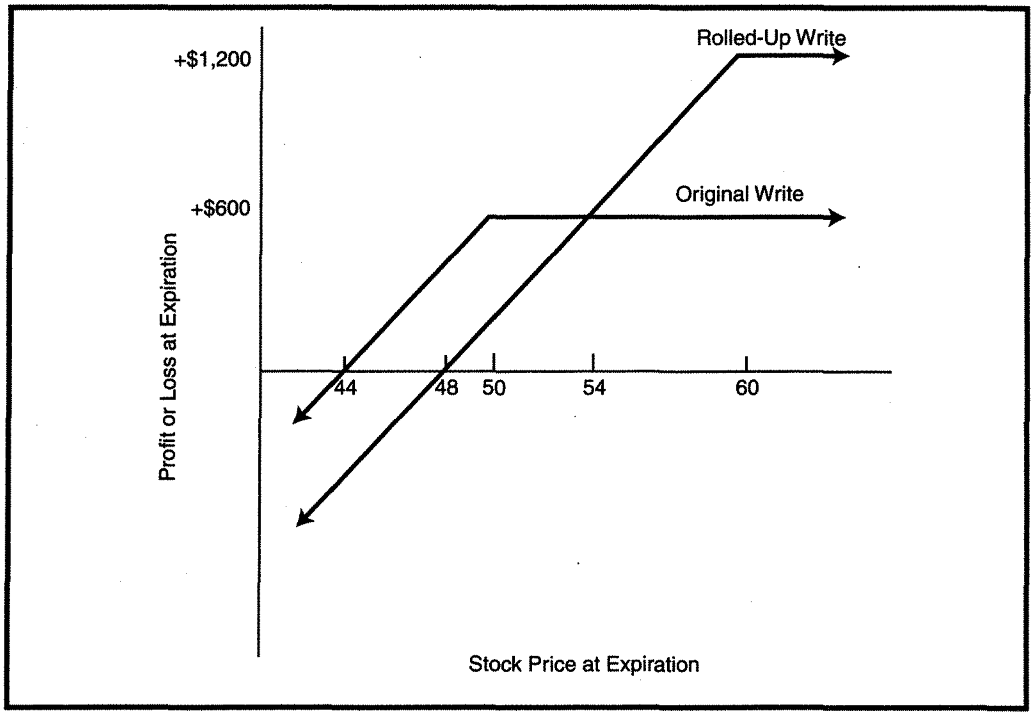
Note that *when one rolls up, there is a debit incurred.* That is, the investor must deposit additional cash into the covered writing position. This was not the case in rolling down, because credits were generated. Debits are considered by many investors to be a seriously negative aspect of rolling up, and they therefore prefer never to roll up for debits. Although the debit required to roll up may not be a negative aspect to every investor, it does translate directly into the fact that the break-even point is raised and the writer is subjecting himself to a potential loss if the stock should pull back. It is often advantageous to roll to a more distant expiration when rolling up. This will reduce the debit required.

The rolled-up position has a break-even point of 48. Thus, if XYZ falls back to 48, the writer who rolled up will be left with no profit. However, if he had not rolled up, he would have made 4 points with XYZ at 48 at expiration in the original position. A further comparison can be made between the original position and the rolled-up position. The two are equal at July expiration at a stock price of 54; both have a profit of 6 points with XYZ at 54 at July expiration. Thus, although it may appear attractive to roll up, one should determine the point at which the rolled-up position and the original position will be equal at expiration. If the writer believes XYZ could be subject to a 10% correction by expiration from 60 to 54 – certainly not out of the question for any stock – he should stay with his original position.

Figure 2-5 compares the original position with the rolled-up position. Note that the break-even point has moved up from 44 to 48; the maximum profit potential has increased from 6 points to 12 points; and at expiration the two writes are equal, at 54.

In summary, it can be said that rolling up increases one's profit potential but also exposes one to risk of loss if a stock price reversal should occur. Therefore, an ele-

FIGURE 2-5.
Comparison: original write vs. rolled-up position.



ment of risk is introduced as well as the possibility of increased rewards. Generally, it is not advisable to roll up if at least a 10% correction in the stock price cannot be withstood. One's initial goals for the covered write were set when the position was established. If the stock advances and these goals are being met, the writer should be very cautious about risking that profit.

A SERIOUS BUT ALL-TOO-COMMON MISTAKE

When an investor is overly intent on keeping his stock from being called away (perhaps he is writing calls against stock that he really has no intention of selling), then he will normally roll up and/or forward to a more distant expiration month whenever the stock rises to the strike of the written call. Most of these rolls incur a debit. If the stock is particularly strong, or if there is a strong bull market, these rolls for debits begin to weigh heavily on the psychology of the covered writer. Eventually, he wears down emotionally and makes a mistake. He typically takes one of two roads: (1) He buys back all of the calls for a (large) debit, leaving the entire stock holding exposed to downside movements after it has risen dramatically in price and after he

has amassed a fairly large series of debits from previous rolls; or (2) he begins to sell some out-of-the-money naked puts to bring in credits to reduce the cost of continually rolling the calls up for debits. This latter action is even worse, because the entire position is now leveraged tremendously, and a sharp drop in the stock price may cause horrendous losses – perhaps enough to wipe out the entire account. As fate would have it, these mistakes are usually made when the stock is near a top in price. Any price decline after such a dramatic rise is usually a sharp and painful one.

The best way to avoid this type of potentially serious mistake is to allow the stock to be called away at some point. Then, using the funds that are released, either establish a new position in another stock or perhaps even utilize another strategy for a while. If that is not feasible, at least avoid making a radical change in strategy *after* the stock has had a particularly strong rise. Leveraging the position through naked put sales on top of rolling the calls up for debits should expressly be avoided.

The discussion to this point has been directed at rolling up *before* expiration. At or near expiration, when the time value premium has disappeared from the written call, one may have no choice but to write the next-higher striking price if he wants to retain his stock. This is discussed when we analyze action to take at or near expiration.

If the underlying stock rises, one's choices are not necessarily limited to rolling up or doing nothing. As the stock increases in price, the written call will lose its time premium and may begin to trade near parity. The writer may decide to close the position himself – perhaps well in advance of expiration – by buying back the written call and selling the stock out, hopefully near parity.

Example: A customer originally bought XYZ at 25 and sold the 6-month July 25 for 3 points – a net of 22. Now, three months later, XYZ has risen to 33 and the call is trading at 8 (parity) because it is so deeply in-the-money. At this point, the writer may want to sell the stock at 33 and buy back the call at 8, thereby realizing an effective net of 25 for the covered write, which is his maximum profit potential. This is certainly preferable to remaining in the position for three more months with no more profit potential available. The advantage of closing a parity covered write early is that one is realizing the maximum return in a shorter period than anticipated. He is thereby increasing his annualized return on the position. Although it is generally to the cash writer's advantage (margin writers read on) to take such action, there are a few additional costs involved that he would not experience if he held the position until the call expired. First, the commission for the option purchase (buy-back) is an additional expense. Second, he will be selling his stock at a higher price than the striking price, so he may pay a slightly higher commission on that trade as well. If there is a dividend left until expiration, he will not be receiving that dividend if he closes the

write early. Of course, if the trade was done in a margin account, the writer will be reducing the margin interest that he had planned to pay in the position, because the debit will be erased earlier. In most cases, the increased commissions are very small and the lost dividend is not significant compared to the increase in annualized return that one can achieve by closing the position early. However, this is not always true, and one should be aware of exactly what his costs are for closing the position early.

Obviously, getting out of a covered writing position can be as difficult as establishing it. Therefore, one should place the order to close the position with his brokerage firm's option desk, to be executed as a "net" order. The same traders who facilitate establishing covered writing positions at net prices will also facilitate getting out of the positions. One would normally place the order by saying that he wanted to sell his stock and buy the option "at parity" or, in the example, at "25 net." Just as it is often necessary to be in contact with both the option and stock exchanges to *establish* a position, so is it necessary to maintain the same contacts to *remove* a position at parity.

ACTION TO TAKE AT OR NEAR EXPIRATION

As expiration nears and the time value premium disappears from a written call, the covered writer may often want to *roll forward,* that is, buy back the currently written call and sell a longer-term call with the same striking price. For an in-the-money call, the optimum time to roll forward is generally when the time value premium has completely disappeared from the call. For an out-of-the-money call, the correct time to move into the more distant option series is when the return offered by the near-term option is less than the return offered by the longer-term call.

The in-the-money case is quite simple to analyze. As long as there is time premium left in the call, there is little risk of assignment, and therefore the writer is earning time premium by remaining with the original call. However, when the option begins to trade at parity or a discount, there arises a significant probability of exercise by arbitrageurs. It is at this time that the writer should roll the in-the-money call forward. For example, if XYZ were offered at 51 and the July 50 call were bid at 1, the writer should be rolling forward into the October 50 or January 50 call.

The out-of-the-money case is a little more difficult to handle, but a relatively straightforward analysis can be applied to facilitate the writer's decision. One can compute the return per day remaining in the written call and compare it to the net return per day from the longer-term call. If the longer-term call has a higher return, one should roll forward.

Example: An investor previously entered a covered writing situation in which he wrote five January 30 calls against 500 XYZ common. The following prices exist currently, 1 month before expiration:

XYZ common, $29\frac{1}{2}$;

January 30 call, $\frac{1}{2}$; and

April 30 call, $2\frac{1}{2}$.

The writer can only make $\frac{1}{2}$ a point more of time premium on this covered write for the time remaining until expiration. It is possible that his money could be put to better use by rolling forward to the April 30 call. Commissions for rolling forward must be subtracted from the April 30's premium to present a true comparison.

By remaining in the January 30, the writer could make, at most, $250 for the 30 days remaining until January expiration. This is a return of $8.33 per day. The commissions for rolling forward would be approximately $100, including both the buyback and the new sale. Since the current time premium in the April 30 call is $250 per option, this would mean that the writer would stand to make 5 times $250 less the $100 in commissions during the 120-day period until April expiration; $1,150 divided by 120 days is $9.58 per day. Thus, the per-day return is higher from the April 30 than from the January 30, after commissions are included. The writer should roll forward to the April 30 at this time.

Rolling forward, since it involves a positive cash flow (that is, it is a credit transaction) simultaneously increases the writer's maximum profit potential and lowers the break-even point. In the example above, the credit for rolling forward is 2 points, so the break-even point will be lowered by 2 points and the maximum profit potential is also increased by the 2-point credit.

A simple calculator can provide one with the return-per-day calculation necessary to make the decision concerning rolling forward. The preceding analysis is only directly applicable to rolling forward at the *same striking price.* Rolling-up or rolling-down decisions at expiration, since they involve different striking prices, cannot be based solely on the differential returns in time premium values offered by the options in question.

In the earlier discussion concerning rolling up, it was mentioned that at or near expiration, one may have no choice but to write the next higher striking price if he wants to retain his stock. This does not necessarily involve a debit transaction, however. If the stock is volatile enough, one might even be able to *roll up* for even money or a slight credit at expiration. Should this occur, it would be a desirable situation and should always be taken advantage of.

Example: The following prices exist at January expiration:

XYZ, 50;

XYZ January 45 call, 5; and

XYZ July 50 call, 7.

In this case, if one had originally written the January 45 call, he could now roll up to the July 50 at expiration for a *credit* of 2 points. This action is quite prudent, since the break-even point and the maximum profit potential are enhanced. The break-even point is lowered by the 2 points of credit received from rolling up. The maximum profit potential is increased substantially – by 7 points – since the striking price is raised by 5 points and an additional 2 points of credit are taken in from the roll up. Consequently, whenever one can roll up for a credit, a situation that would normally arise only on more volatile stocks, he should do so.

Another choice that may occur at or near expiration is that of *rolling down.* The case may arise whereby one has allowed a written call to expire worthless with the stock more than a small distance below the striking price. The writer is then faced with the decision of either writing a small-premium out-of-the-money call or a larger-premium in-the-money call. Again, an example may prove to be useful.

Example: Just after the January 25 call has expired worthless,

XYZ is at 22,

XYZ July 25 call at 3/4, and

XYZ July 20 call at 3½.

If the investor were now to write the July 25 call, he would be receiving only 3/4 of a point of downside protection. However, his maximum profit potential would be quite large if XYZ could rally to 25 by expiration. On the other hand, the July 20 at 3½ is an attractive write that affords substantial downside protection, and its 1½ points of time value premium are twice that offered by the July 25 call. In a purely analytic sense, one should not base his decision on what his performance has been to date, but that is a difficult axiom to apply in practice. If this investor owns XYZ at a higher price, he will almost surely opt for the July 25 call. If, however, he owns XYZ at approximately the same price, he will have no qualms about writing the July 20 call. There is no absolute rule that can be applied to all such situations, but one is usually better off writing the call that provides the best balance between return and downside protection at all times. Only if one is bullish on the underlying stock should he write the July 25 call.

AVOIDING THE UNCOVERED POSITION

There is a margin rule that the covered writer must be aware of if he is considering taking any sort of follow-up action on the day that the written call ceases trading. If another call is sold on that day, even though the written call is obviously going to expire worthless, the writer will be considered uncovered for margin purposes over the weekend and will be obligated to put forth the collateral for an uncovered option. This is usually not what the writer intends to do; being aware of this rule will eliminate unwanted margin calls. Furthermore, uncovered options may be considered unsuitable for many covered writers.

Example: A customer owns XYZ and has January 20 calls outstanding on the last day of trading of the January series (the third Friday of January; the calls actually do not expire until the following day, Saturday). If XYZ is at 15 on the last day of trading, the January 20 call will almost certainly expire worthless. However, should the writer decide to sell a longer-term call on that day without buying back the January 20, he will be considered uncovered over the weekend. Thus, *if one plans to wait for an option to expire totally worthless before writing another call, he must wait until the Monday after expiration before writing again, assuming that he wants to remain covered.* The writer should also realize that it is possible for some sort of news item to be announced between the end of trading in an option series and the actual expiration of the series. Thus, call holders might exercise because they believe the stock will jump sufficiently in price to make the exercise profitable. This has happened in the past, two of the most notable cases being IBM in January 1975 and Carrier Corp. in September 1978.

WHEN TO LET STOCK BE CALLED AWAY

Another alternative that is open to the writer as the written call approaches expiration is to let the stock be called away if it is above the striking price. In many cases, it is to the advantage of the writer to keep rolling options forward for credits, thereby retaining his stock ownership. However, in certain cases, it may be advisable to allow the stock to be called away. It should be emphasized that the writer often has a definite choice in this matter, since he can generally tell when the call is about to be exercised – when the time value premium disappears.

The reason that it is *normally* desirable to roll forward is that, over time, the covered writer will realize a higher return by rolling instead of being called. The option commissions for rolling forward every three or six months are smaller than the commissions for buying and selling the underlying stock every three or six months, and therefore the eventual return will be higher. However, if an inferior return has

to be accepted or the break-even point will be raised significantly by rolling forward, one must consider the alternative of letting the stock be called away.

Example: A covered write is established by buying XYZ at 49 and selling an April 50 call for 3 points. The original break-even point was thus 46. Near expiration, suppose XYZ has risen to 56 and the April 50 is trading at 6. If the investor wants to roll forward, now is the time to do so, because the call is at parity. However, he notes that the choices are somewhat limited. Suppose the following prices exist with XYZ at 56: XYZ October 50 call, 7; and XYZ October 60 call, 2. It seems apparent that the premium levels have declined since the original writing position was established, but that is an occurrence beyond the control of the writer, who must work in the current market environment.

If the writer attempts to roll forward to the October 50, he could make at most 1 additional point of profit until October (the time premium in the call). This represents an extremely low rate of return, and the writer should reject this alternative since there are surely better returns available in covered writes on other securities.

On the other hand, if the writer tries to roll up and forward, it will cost 4 points to do so – 6 points to buy back the April 50 less 2 points received for the October 60. This debit transaction means that his break-even point would move up from the original level of 46 to a new level of 50. If the common declines below 54, he would be eating into profits already at hand, since the October 60 provides only 2 points of protection from the current stock price of 56. If the writer is not confidently bullish on the outlook for XYZ, he should not roll up and forward.

At this point, the writer has exhausted his alternatives for rolling. His remaining choice is to let the stock be called away and to use the proceeds to establish a covered write in a new stock, one that offers a more attractive rate of return with reasonable downside protection. This choice of allowing the stock to be called away is generally the wisest strategy if both of the following criteria are met:

1. Rolling forward offers only a minimal return.
2. Rolling up and forward significantly raises the break-even point and leaves the position relatively unprotected should the stock drop in price.

SPECIAL WRITING SITUATIONS

Our discussions have pertained directly to writing against common stock. However, one may also write covered call options against convertible securities, warrants, or LEAPS. In addition, a different type of covered writing strategy – the incremental

return concept – is described that has great appeal to large stockholders, both individuals and institutions.

COVERED WRITING AGAINST A CONVERTIBLE SECURITY

It may be more advantageous to buy a security that is convertible into common stock than to buy the stock itself, for covered call writing purposes. Convertible bonds and convertible preferred stocks are securities commonly used for this purpose. One advantage of using the convertible security is that it often has a higher yield than does the common stock itself.

Before describing the covered write, it may be beneficial to review the basics of convertible securities. Suppose XYZ common stock has an XYZ convertible Preferred A stock that is convertible into 1.5 shares of common. The number of shares of common that the convertible security converts into is an important piece of information that the writer must know. It can be found in a *Standard & Poor's Stock Guide* (or *Bond Guide,* in the case of convertible bonds).

The writer also needs to determine how many shares of the convertible security must be owned in order to equal 100 shares of the common stock. This is quickly determined by dividing 100 by the conversion ratio – 1.5 in our XYZ example. Since 100 divided by 1.5 equals 66.666, one must own 67 shares of XYZ cv Pfd A to cover the sale of one XYZ option for 100 shares of common. Note that neither the market prices of XYZ common nor the convertible security are necessary for this computation.

When using a convertible bond, the conversion information is usually stated in a form such as, "converts into 50 shares at a price of 20." The price is irrelevant. What is important is the number of shares that the bond converts into – 50 in this case. Thus, if one were using these bonds for covered writing of one call, he would need two (2,000) bonds to own the equivalent of 100 shares of stock.

Once one knows how much of the convertible security must be purchased, he can use the actual prices of the securities, and their yields, to determine whether a covered write against the common or the convertible is more attractive.

Example: The following information is known:

XYZ common, 50;

XYZ cv Pfd A, 80;

XYZ July 50 call, 5;

XYZ dividend, 1.00 per share annually; and

XYZ cv Pfd A dividend, 5.00 per share annually.

Note that, in either case, the same call – the July 50 – would be written. *The use of the convertible as the underlying security does not alter the choice of which option to use.* To make the comparison of returns easier, commissions are ignored in the calculations given in Table 2-25. In reality, the commissions for the stock purchase, either common or preferred, would be very similar. Thus, from a numerical point of view, it appears to be more advantageous to write against the convertible than against the common.

TABLE 2-25.
Comparison of common and convertible writes.

	Write against Common	Write against Convertible
Buy underlying security	$5,000 (100 XYZ)	$5,360 (67 XYZ cv Pfd A)
Sell one July 50 call	- 500	- 500
Net cash investment	$4,500	$4,860
Premium collected	$ 500	$ 500
Dividends until July	50	250
Maximum profit potential	$ 550	$ 750
Return (profit divided by investment)	12.2%	15.4%

When writing against a convertible security, additional considerations should be looked at. The first is the *premium of the convertible security.* In the example, with XYZ selling at 50, the XYZ cv Pfd A has a true value of 1.5 times 50, or $75 per share. However, it is selling at 80, which represents a premium of 5 points above its computed value of 75. *Normally, one would not want to buy a convertible security if the premium is too large.* In this example, the premium appears quite reasonable. Any convertible premium greater than 15% above computed value might be considered to be too large.

Another consideration when writing against convertible securities is the *handling of assignment.* If the writer is assigned, he may either (1) convert his preferred stock into common and deliver that, or (2) sell the preferred in the market and use the proceeds to buy 100 shares of common stock in the market for delivery against the assignment notice. The second choice is usually preferable if the convertible security has any premium at all, since converting the preferred into common causes the loss of any premium in the convertible, as well as the loss of accrued interest in the case of a convertible bond.

The writer should also be aware of whether or not the convertible is *callable* and, if so, what the exact terms are. Once the convertible has been called by the company, it will no longer trade in relation to the underlying stock, but will instead trade at the call price. Thus, if the stock should climb sharply, the writer could be incurring losses on his written option without any corresponding benefit from his convertible security. Consequently, if the convertible is called, the entire position should normally be closed immediately by selling the convertible and buying the option back.

Other aspects of covered writing, such as rolling down or forward, do not change even if the option is written against a convertible security. One would take action based on the relationship of the option price and the common stock price, as usual.

WRITING AGAINST WARRANTS

It is also possible to write covered call options against warrants. Again, one must own enough warrants to convert into 100 shares of the underlying stock; generally, this would be 100 warrants. The transaction must be a cash transaction, the warrants must be paid for in full, and they have no loan value. Technically, listed warrants may be marginable, but many brokerage houses still require payment in full. There may be *an additional investment requirement.* Warrants also have an exercise price. If the exercise price of the warrant is *higher* than the striking price of the call, the covered writer must also deposit the difference between the two as part of his investment.

The advantage of using warrants is that, if they are deeply in-the-money, they may provide the cash covered writer with a higher return, since less of an investment is involved.

Example: XYZ is at 50 and there are XYZ warrants to buy the common at 25. Since the warrant is so deeply in-the-money, it will be selling for approximately $25 per warrant. XYZ pays no dividend. Thus, if the writer were considering a covered write of the XYZ July 50, he might choose to use the warrant instead of the common, since his investment, per 100 shares of common, would only be $2,500 instead of the $5,000 required to buy 100 XYZ. The potential profit would be the same in either case because no dividend is involved.

Even if the stock does pay a dividend (warrants themselves have no dividend), the writer may still be able to earn a higher return by writing against the warrant than against the common because of the smaller investment involved. This would depend, of course, on the exact size of the dividend and on how deeply the warrant is in-the-money.

Covered writing against warrants is not a frequent practice because of the small number of warrants on optionable stocks and the problems inherent in checking available returns. However, in certain circumstances, the writer may actually gain a decided advantage by writing against a deep in-the-money warrant. It is often not advisable to write against a warrant that is at- or out-of-the-money, since it can decline by a large percentage if the underlying stock drops in price, producing a high-risk position. Also, the writer's investment may increase in this case if he rolls down to an option with a striking price lower than the warrant's exercise price.

WRITING AGAINST LEAPS

A form of covered call writing can be constructed by buying LEAPS call options and selling shorter-term out-of-the-money calls against them. This strategy is much like writing calls against warrants. This strategy is discussed in more detail in Chapter 25 on LEAPS, under the subject of diagonal spreads.

PERCS

The PERCS (Preferred Equity Redemption Cumulative Stock) is a form of covered writing. It is discussed in Chapter 32.

THE INCREMENTAL RETURN CONCEPT OF COVERED WRITING

The incremental return concept of covered call writing is a way in which *the covered writer can earn the full value of stock appreciation between today's stock price and a target sale price, which may be substantially higher.* At the same time, the writer can earn an incremental, positive return from writing options.

Many institutional investors are somewhat apprehensive about covered call writing because of the upside limit that is placed on profit potential. If a call is written against a stock that subsequently declines in price, most institutional managers would *not* view this as an unfavorable situation, since they would be outperforming all managers who owned the stock and who did not write a call. However, if the stock rises substantially after the call is written, many institutional managers do not like having their profits limited by the written call. This strategy is not only for institutional money managers, although one should have a relatively substantial holding in an underlying stock to attempt the strategy – at least 500 shares and preferably 1,000 shares or more. *The incremental return concept can be used by anyone who is planning to hold his stock, even if it should temporarily decline in price, until it reaches a predetermined, higher price at which he is willing to sell the stock.*

The basic strategy involves, as an initial step, selecting the target price at which the writer is willing to sell his stock.

Example: A customer owns 1,000 shares of XYZ, which is currently at 60, and is willing to sell the stock at 80. In the meantime, he would like to realize a *positive cash flow* from writing options against his stock. This positive cash flow does not necessarily result in a realized option gain until the stock is called away. Most likely, with the stock at 60, there would not be options available with a striking price of 80, so one could not write 10 July 80's, for example. This would not be an optimum strategy even if the July 80's existed, for the investor would be receiving so little in option premiums – perhaps 10 cents per call – that writing might not be worthwhile. The incremental return strategy allows this investor to achieve his objectives regardless of the existence of options with a higher striking price.

The foundation of the incremental return strategy is to write against only a part of the entire stock holding initially, and to write these calls at the striking price nearest the current stock price. Then, should the stock move up to the next higher striking price, one rolls up for a *credit* by adding to the number of calls written. Rolling for a credit is mandatory and is the key to the strategy. Eventually, the stock reaches the target price and the stock is called away, the investor sells all his stock at the target price, and in addition earns the total credits from all the option transactions.

Example: XYZ is 60, the investor owns 1,000 shares, and his target price is 80. One might begin by selling three of the longest-term calls at 60 for 7 points apiece. Table 2-26 shows how a poor case – one in which the stock climbs directly to the target price – might work. As Table 2-26 shows, if XYZ rose to 70 in one month, the three original calls would be bought back and enough calls at 70 would be sold to produce a credit – 5 XYZ October 70's. If the stock continued upward to 80 in another month, the 5 calls would be bought back and the entire position – 10 calls – would be written against the target price.

If XYZ remains above 80, the stock will be called away and *all 1,000 shares will be sold at the target price of 80.* In addition, the investor will earn all the option credits generated along the way. These amount to $2,800. Thus, the writer obtained the full appreciation of his stock to the target price plus an incremental, positive return from option writing.

In a flat market, the strategy is relatively easy to monitor. If a written call loses its time value premium and therefore might be subject to assignment, the writer can roll forward to a more distant expiration series, keeping the quantity of written calls constant. This transaction would generate additional credits as well.

TABLE 2-26.
Two months of incremental return strategy.

Day 1: XYZ = 60	
Sell 3 XYZ October 60's at 7	+$2,100 credit
One month later: XYZ = 70	
Buy back the 3 XYZ Oct 60's at 11 and	–$3,300 debit
sell 5 XYZ Oct 70's at 7	+$3,500 credit
Two months later: XYZ = 80	
Buy back the 5 Oct 70's at 11 and	–$5,500 debit
sell 10 XYZ Oct 80's at 6	+$6,000 credit
	+$2,800 credit

COVERED CALL WRITING SUMMARY

This concludes the chapter on covered call writing. The strategy will be referred to later, when compared with other strategies. Here is a brief summary of the more important points that were discussed.

Covered call writing is a viable strategy because it reduces the risk of stock ownership and will make one's portfolio less volatile to short-term market movements. It should be understood, however, that covered call writing may underperform stock ownership in general because of the fact that stocks can rise great distances, while a covered write has limited upside profit potential. The choice of which call to write can make for a more aggressive or more conservative write. Writing in-the-money calls is strategically more conservative than writing out-of-the-money calls, because of the larger amount of downside protection received. The total return concept of covered call writing attempts to achieve the maximum balance between income from all sources – option premiums, stock ownership, and dividend income – and downside protection. This balance is usually realized by writing calls when the stock is near the striking price, either slightly in- or slightly out-of-the-money.

The writer should compute various returns before entering into the position: the return if exercised, the return if the stock is unchanged at expiration, and the break-even point. To truly compare various writes, returns should be annualized, and all commissions and dividends should be included in the calculations. Returns will be increased by taking larger positions in the underlying stock – 500 or 1,000 shares. Also, by utilizing a brokerage firm's capability to produce "net" executions, buying the stock and selling the call at a specified net price differential, one will receive better executions and realize higher returns in the long run.

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Example: A customer owns 1,000 shares of XYZ, which is currently at 60, and is willing to sell the stock at 80. In the meantime, he would like to realize a *positive cash flow* from writing options against his stock. This positive cash flow does not necessarily result in a realized option gain until the stock is called away. Most likely, with the stock at 60, there would not be options available with a striking price of 80, so one could not write 10 July 80's, for example. This would not be an optimum strategy even if the July 80's existed, for the investor would be receiving so little in option premiums – perhaps 10 cents per call – that writing might not be worthwhile. The incremental return strategy allows this investor to achieve his objectives regardless of the existence of options with a higher striking price.

The foundation of the incremental return strategy is to write against only a part of the entire stock holding initially, and to write these calls at the striking price nearest the current stock price. Then, should the stock move up to the next higher striking price, one rolls up for a *credit* by adding to the number of calls written. Rolling for a credit is mandatory and is the key to the strategy. Eventually, the stock reaches the target price and the stock is called away, the investor sells all his stock at the target price, and in addition earns the total credits from all the option transactions.

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The writer should compute various returns before entering into the position: the return if exercised, the return if the stock is unchanged at expiration, and the break-even point. To truly compare various writes, returns should be annualized, and all commissions and dividends should be included in the calculations. Returns will be increased by taking larger positions in the underlying stock – 500 or 1,000 shares. Also, by utilizing a brokerage firm's capability to produce "net" executions, buying the stock and selling the call at a specified net price differential, one will receive better executions and realize higher returns in the long run.

The selection of which call to write should be made on a comparison of available returns and downside protection. One can sometimes write part of his position out-of-the-money and the other part in-the-money to force a balance between return and protection that might not otherwise exist. Finally, one should not write against an underlying stock if he is bearish on the stock. The writer should be slightly bullish, or at least neutral, on the underlying stock.

Follow-up action can be as important as the selection of the initial position itself. By rolling down if the underlying stock drops, the investor can add downside protection and current income. If one is unwilling to limit his upside potential too severely, he may consider rolling down only part of his call writing position. As the written call expires, the writer should roll forward into a more distant expiration month if the stock is relatively close to the original striking price. Higher consistent returns are achieved in this manner, because one is not spending additional stock commissions by letting the stock be called away. An aggressive follow-up action can also be taken when the underlying stock rises in price: The writer can roll up to a higher striking price. This action increases the maximum profit potential but also exposes the position to loss if the stock should subsequently decline. One would want to take no follow-up action and let his stock be called if it is above the striking price and if there are better returns available elsewhere in other securities.

Covered call writing can also be done against convertible securities – bonds or preferred stocks. These convertibles sometimes offer higher dividend yields and therefore increase the overall return from covered writing. Also, the use of warrants or LEAPS in place of the underlying stock may be advantageous in certain circumstances, because the net investment is lowered while the profit potential remains the same. Therefore, the overall return could be higher.

Finally, the larger individual stockholder or institutional investor who wants to achieve a certain price for his stock holdings should operate his covered writing strategy under the incremental return concept. This will allow him to realize the full profit potential of his underlying stock, up to the target sale price, and to earn additional positive income from option writing.

CHAPTER 3

Call Buying

The success of a call buying strategy depends primarily on one's ability to select stocks that will go up and to time the selection reasonably well. Thus, call buying is not a strategy in the same sense of the word as most of the other strategies discussed in this text. Most other strategies are designed to remove some of the exactness of stock picking, allowing one to be neutral or at least to have some room for error and still make a profit. Techniques of call buying are important, though, because it is necessary to understand the long side of calls in order to understand more complex strategies correctly.

Call buying is the simplest form of option investment, and therefore is the most frequently used option "strategy" by the public investor. The following section outlines the basic facts that one needs to know to implement an intelligent call buying program.

WHY BUY?

The main attraction in buying calls is that they provide the speculator with a great deal of leverage. One could potentially realize large percentage profits from only a modest rise in price by the underlying stock. Moreover, even though they may be large percentagewise, the risks cannot exceed a fixed dollar amount – the price originally paid for the call. Calls must be paid for in full; they have no margin value and do not constitute equity for margin purposes. Note: The preceding statements regarding payment for an option in full do not necessarily apply to LEAPS options, which were declared marginable in 1999. The following simple example illustrates how a call purchase might work.

Example: Assume that XYZ is at 48 and the 6-month call, the July 50, is selling for 3. Thus, with an investment of $300, the call buyer may participate, for 6 months, in a move upward in the price of XYZ common. If XYZ should rise in price by 10 points (just over 20%), the July 50 call will be worth at least $800 and the call buyer would have a 167% profit on a move in the stock of just over 20%. This is the leverage that attracts speculators to call buying. At expiration, if XYZ is below 50, the buyer's loss is total, but is limited to his initial $300 investment, even if XYZ declines in price substantially. Although this risk is equal to 100% of his initial investment, it is still small dollarwise. *One should normally not invest more than 15% of his risk capital in call buying,* because of the relatively large percentage risks involved.

Some investors participate in call buying on a limited basis to add some upside potential to their portfolios while keeping the risk to a fixed amount. For example, if an investor normally only purchased low-volatility, conservative stocks because he wanted to limit his downside risk, he might consider putting a small percentage of his cash into calls on more volatile stocks. In this manner, he could "trade" higher-risk stocks than he might normally do. If these volatile stocks increase in price, the investor will profit handsomely. However, if they decline substantially – as well they might, being volatile – the investor has limited his dollar risk by owning the calls rather than the stock.

Another reason some investors buy calls is to be able to buy stock at a reasonable price without missing a market.

Example: With XYZ at 75, this investor might buy a call on XYZ at 80. He would like to own XYZ at 80 if it can prove itself capable of rallying and be in-the-money at expiration. He would exercise the call in that case. On the other hand, if XYZ declines in price instead, he has not tied up money in the stock and can lose only an amount equal to the call premium that he paid, an amount that is generally much less than the price of the stock itself.

Another approach to call buying is sometimes utilized, also by an investor who does not want to "miss the market." Suppose an investor knows that, in the near future, he will have an amount of money large enough to purchase a particular stock; perhaps he is closing the sale of his house or a certificate of deposit is maturing. However, he would like to buy the stock now, for he feels a rally is imminent. He might buy calls at the present time if he had a small amount of cash available. The call purchases would require an investment much smaller than the stock purchase. Then, when he receives the cash that he knew was forthcoming, he could exercise the calls and buy the stock. In this way, he might have participated in a rally by the stock before he actually had the money available to pay for the stock in full.

RISK AND REWARD FOR THE CALL BUYER

The most important fact for the call buyer to realize is that he will normally win only if the stock rises in price. All the worthwhile analysis in the world spent in selecting which call to buy will not produce profits if the underlying stock declines. However, this fact should not dissuade one from making reasonable analyses in his call buying selections. Too often, the call buyer feels that a stock will move up, and is correct in that part of his projection, but still loses money on his call purchase because he failed to analyze the risk and rewards involved with the various calls available for purchase at the time. He bought the wrong call on the right stock.

Since the best ally that the call buyer has is upward movement in the underlying stock, the selection of the underlying stock is the most important choice the call buyer has to make. Since timing is so important when buying calls, the technical factors of stock selection probably outweigh the fundamentals; even if positive fundamentals do exist, one does not know how long it will take in order for them to be reflected in the price of the stock. One must be bullish on the underlying stock in order to consider buying calls on that stock. Once the stock selection has been made, only then can the call buyer begin to consider other factors, such as which striking price to use and which expiration to buy. The call buyer may have another ally, but not one that he can normally predict: If the stock on which he owns a call becomes more volatile, the call's price will rise to reflect that change.

The purchase of an out-of-the-money call generally offers both larger potential risk and larger potential reward than does the purchase of an in-the-money call. Many call buyers tend to select the out-of-the-money call merely because it is cheaper in price. *Absolute dollar price should in no way be a deciding factor for the call buyer.* If one's funds are so limited that he can only afford to buy the cheapest calls, he should not be speculating in this strategy. If the underlying stock increases in price substantially, the out-of-the-money call will naturally provide the largest rewards. However, if the stock advances only moderately in price, the in-the-money call may actually perform better.

Example: XYZ is at 65 and the July 60 sells for 7 while the July 70 sells for 3. If the stock moves up to 68 relatively slowly, the buyer of the July 70 – the out-of-the-money call – may actually experience a loss, even if the call has not yet expired. However, the holder of the in-the-money July 60 will definitely have a profit because the call will sell for at least 8 points, its intrinsic value. The point is that, percentagewise, *an in-the-money call will offer better rewards for a modest stock gain, and an out-of-the-money call is better for larger stock gains.*

When risk is considered, the in-the-money call clearly has less probability of risk. In the prior example, the in-the-money call buyer would not lose his entire investment unless XYZ fell by at least 5 points. However, the buyer of the out-of-the-money July 70 would lose all of his investment unless the stock advanced by more than 5 points by expiration. Obviously, the probability that the in-the-money call will expire worthless is much smaller than that for the out-of-the-money call.

The time remaining to expiration is also relevant to the call buyer. If the stock is fairly close to the striking price, the near-term call will most closely follow the price movement of the underlying stock, so it has the greatest rewards and also the greatest risks. The far-term call, because it has a large amount of time remaining, offers the least risk and least percentage reward. *The intermediate-term call offers a moderate amount of each, and is therefore often the most attractive one to buy.* Many times an investor will buy the longer-term call because it only costs a point or a point and a half more than the intermediate-term call. He feels that the extra price is a bargain to pay for three extra months of time. This line of thought may prove somewhat misleading, however, because most call buyers don't hold calls for more than 60 or 90 days. Thus, even though it looks attractive to pay the extra point for the long-term call, it may prove to be an unnecessary expense if, as is usually the case, one will be selling the call in two or three months.

CERTAINTY OF TIMING

The certainty with which one expects the underlying stock to advance may also help to play a part in his selection of which call to buy. If one is fairly sure that the underlying stock is about to rise immediately, he should strive for more reward and not be as concerned about risk. This would mean buying short-term, slightly out-of-the-money calls. Of course, this is only a general rule; one would not normally buy an out-of-the-money call that has only one week remaining until expiration, in any case. At the opposite end of the spectrum, if one is very uncertain about his timing, he should buy the longest-term call, to moderate his risk in case his timing is wrong by a wide margin. This situation could easily result, for example, if one feels that a positive fundamental aspect concerning the company will assert itself and cause the stock to increase in price at an unknown time in the future. Since the buyer does not know whether this positive fundamental will come to light in the next month or six months from now, he should buy the longer-term call to allow room for error in timing.

In many cases, one is not intending to hold the purchased call for any significant period of time; he is just looking to capitalize on a quick, short-term movement by the underlying stock. In this case, he would want to buy a relatively short-term in-the-money call. Although such a call may be more expensive than an out-of-the-

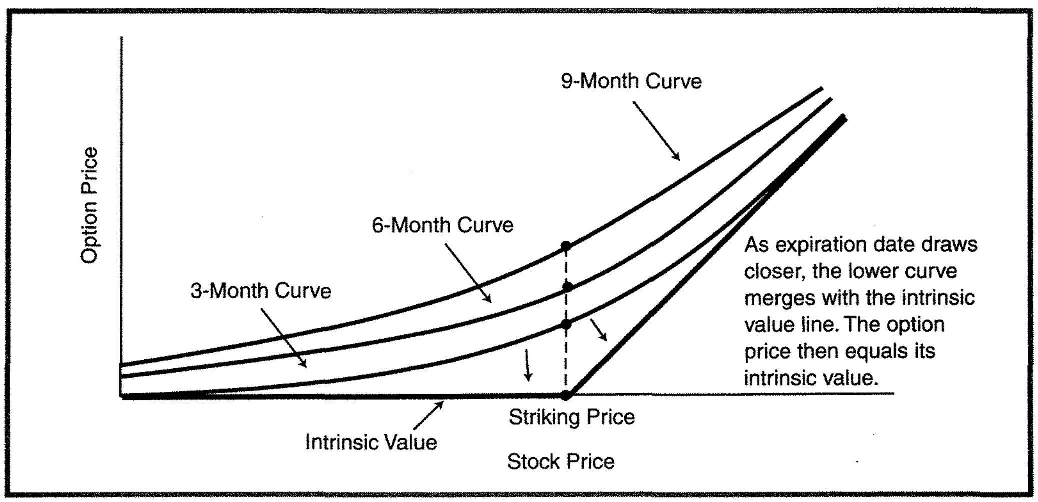
money call on the same underlying stock, it will most surely move up on any increase in price by the underlying stock. Thus, the short-term trader would profit.

THE DELTA

The reader should by now be familiar with basic facts concerning call options: The time premium is highest when the stock is at the striking price of the call; it is lowest deep in- or out-of-the-money; option prices do not decay at a linear rate – the time premium disappears more rapidly as the option approaches expiration. As a further means of review, the *option pricing curve* introduced in Chapter 1 is reprinted here. Notice that all the facts listed above can be observed from Figure 3-1. The curves are much nearer the "intrinsic value" line at the ends than they are in the middle, implying that the time value premium is greatest when the stock is at the strike, and is least when the stock moves away from the strike either into- or out-of-the-money. Furthermore, the fact that the curve for the 3-month option lies only about halfway between the intrinsic value line and the curve of the 9-month option implies that the rate of decay of an at- or near-the-money option is not linear. The reader may also want to refer back to the graph of time value premium decay in Chapter 1 (Figure 1-4).

There is another property of call options that the buyer should be familiar with, the *delta* of the option (also called the *hedge ratio*). Simply stated, *the delta of an option is the amount by which the call will increase or decrease in price if the underlying stock moves by 1 point.*

FIGURE 3-1.
Option pricing curve; 3-, 6-, and 9-month calls.



Example: The delta of a call option is close to 1 when the underlying stock is well above the striking price of the call. If XYZ were 60 and the XYZ July 50 call were $10\frac{1}{8}$, the call would change in price by nearly 1 point if XYZ moved by 1 point, either up or down. A deeply out-of-the-money call has a delta of nearly zero. If XYZ were 40, the July 50 call might be selling at $\frac{1}{4}$ of a point. The call would change very little in price if XYZ moved by one point, to either 41 or 39. When the stock is at the striking price, the delta is usually between one-half of a point and five-eighths of a point. Very long-term calls may have even larger at-the-money deltas. Thus, if XYZ were 50 and the XYZ July 50 call were 5, the call might increase to $5\frac{1}{2}$ if XYZ rose to 51 or decrease to $4\frac{1}{2}$ if XYZ dropped to 49.

Actually, the delta changes each time the underlying stock changes even fractionally in price; it is an exact mathematical derivation that is presented in a later chapter. This is most easily seen by the fact that a deep in-the-money option has a delta of 1. However, if the stock should undergo a series of 1-point drops down to the striking price, the delta will be more like $\frac{1}{2}$, certainly not 1 any longer. In reality, the delta changed instantaneously all during the price decline by the stock. For those who are geometrically inclined, the preceding option price curve is useful in determining a graphic representation of the delta. The delta is the slope of the tangent line to the price curve. Notice that a deeply in-the-money option lies to the upper right side of the curve, very nearly on the intrinsic value line, which has a slope of 1 above the strike. Similarly, a deeply out-of-the-money call lies to the left on the price curve, again near the intrinsic value line, which has a slope of zero below the strike.

Since it is more common to relate the option's price change to a full point change in the underlying stock (rather than to deal in "instantaneous" price changes), the concepts of *up delta* and *down delta* arise. That is, if the underlying stock moves up by 1 full point, a call with a delta of .50 might increase by $\frac{5}{8}$. However, should the stock fall by one full point, the call might decrease by only $\frac{3}{8}$. There is a different net price change in the call when the stock moves up by 1 full point as opposed to when it falls by a point. The up delta is observed to be $\frac{5}{8}$ while the down delta is $\frac{3}{8}$. In the true mathematical sense, there is only one delta and it measures "instantaneous" price change. The concepts of up delta and down delta are practical, rather than theoretical, concepts that merely illustrate the fact that the true delta changes whenever the stock price changes, even by as little as 1 point. In the following examples and in later chapters, only one delta is referred to.

The delta is an important piece of information for the call buyer because it can tell him how much of an increase or decrease he can expect for short-term moves by the underlying stock. This piece of information may help the buyer decide which call to buy.

Example: If XYZ is $47\frac{1}{2}$ and the call buyer expects a quick, but possibly limited, rise in price in the underlying stock, should he buy the 45 call or the 50 call? The delta may help him decide. He has the following information:

XYZ: $47\frac{1}{2}$	XYZ July 45 call:	price = $3\frac{1}{2}$,	delta = $\frac{5}{8}$
	XYZ July 50 call:	price = 1,	delta = $\frac{1}{4}$

It will make matters easier to make a slightly incorrect, but simplifying, assumption that the deltas remain constant over the short term. Which call is the better buy if the buyer expects the stock to quickly rise to 49? This would represent a $1\frac{1}{2}$-point increase in XYZ, which would translate into a $\frac{15}{16}$ increase in the July 45 ($1\frac{1}{2}$ times $\frac{5}{8}$) or a $\frac{3}{8}$ increase in the July 50 ($1\frac{1}{2}$ times $\frac{1}{4}$). Consequently, the July 45, if it increased in price by $\frac{15}{16}$, would appreciate by 27%. The July 50, if it increased by $\frac{3}{8}$, would appreciate by over 37%. Thus, the July 50 appears to be the better buy in this simple example. Commissions should, of course, be included when making an analysis for actual investment.

The investor does not have to bother with computing deltas for himself. Any good call-buying data service will supply the information, and some brokerage houses provide this information free of charge.

More advanced applications of deltas are described in many of the succeeding chapters, as they apply to a variety of strategies.

WHICH OPTION TO BUY?

There are various trading strategies, some short-term, some long-term (even buy and hold). If one decides to use an option to implement a trading strategy, the *time horizon* of the strategy itself often dictates the general category of option that should be bought – in-the-money versus out-of-the-money, near-term versus long-term, etc. This statement is true whether one is referring to stock, index, or futures options. The general rule is this: *The shorter-term the strategy, the higher the delta should be of the instrument being used to trade the strategy.*

DAY TRADING

For example, day trading has become a popular endeavor. Statistics have been produced that indicate that most day traders lose money. In fact, there *are* profitable day traders; it simply requires more and harder work than many are willing to invest. Many day traders have attempted to use options in their strategies. These day traders

apparently are attracted by the leverage available from options, but they often lose money via option trading as well.

What many of these option-oriented day traders fail to realize is that, for day-trading purposes, the instrument with the *highest* possible delta should be used. That instrument is the underlying, for it has a delta of 1.0. Day trading is hard enough without complicating it by trying to use options. So of you're day trading Microsoft (MSFT), trade the stock, not an option.

What makes options difficult in such a short-term situation is their relatively wide bid-asked spread, as compared to that of the underlying instrument itself. Also, a day trader is looking to capture only a small part of the underlying's daily move; an at-the-money or out-of-the-money option just won't respond well enough to those movements. That is, if the delta is too low, there just isn't enough room for the option day trader to make money.

If a day trader insists on using options, a short-term, in-the-money should be bought, for it has the largest delta available – preferably something approaching .90 or higher. This option will respond quickly to small movements by the underlying.

SHORT-TERM TRADING

Suppose one employs a strategy whereby he expects to hold the underlying for approximately a week or two. In this case, just as with day trading, a high delta is desirable. However, now that the holding period is more than a day, it may be appropriate to buy an option as opposed to merely trading the underlying, because the option lessens the risk of a surprisingly large downside move. Still, it is the short-term, in-the-money option that should be bought, for it has the largest delta, and will thus respond most closely to the movement in the underlying stock. Such an option has a very high delta, usually in excess of .80. Part of the reason that the high-delta options make sense in such situations is that one is fairly certain of the timing of day trading or very short-term trading systems. *When the system being used for selection of which stock to trade has a high degree of timing accuracy, then the high-delta option is called for.*

INTERMEDIATE-TERM TRADING

As the time horizon of one's trading strategy lengthens, it is appropriate to use an option with a lesser delta. This generally means that the timing of the selection process is less exact. One might be using a trading system based, for example, on sentiment, which is generally not an exact timing indicator, but rather one that indicates a general trend change at major turning points. The timing of the forthcoming move

is not exact, because it often takes time for an extreme change in sentiment to reflect itself in a change of direction by the underlying.

Hence, for a strategy such as this, one would want to use an option with a smaller delta. The investor would limit his risk by using such an option, knowing that large moves are possible since the position is going to be held for several weeks or perhaps even a couple of months or more. Therefore, an at-the-money option can be used in such situations.

LONG-TERM TRADING

If one's strategy is even longer-term, an option with a lower delta can be considered. Such strategies would generally have only vague timing qualities, such as selecting a stock to buy based on the general fundamental outlook for the company. In the extreme, it would even apply to "buy and hold" strategies.

Generally, buying out-of-the-money options is not recommended; but for very long-term strategies, one might consider something *slightly* out-of-the-money, or at least a fairly long-term at-the-money option. In either case, that option will have a lower delta as compared to the options that have been recommended for the other strategies mentioned above. Alternatively, LEAPS options might be appropriate for stock strategies of this type.

ADVANCED SELECTION CRITERIA

The criteria presented previously represented elementary techniques for selecting which call to buy. In actual practice, one is not usually bullish on just one stock at a time. In fact, the investor would like to have a list of the "best" calls to buy at any given time. Then, using some method of stock selection, either technical or fundamental, he can select three or four calls that appear to offer the best rewards. This list should be ranked in order of the best potential rewards available, but the construction of the list itself is important.

Call option rankings for buying purposes must be based on the volatilities of the underlying stocks. This is not easy to do mathematically, and as a result many published rankings of calls are based strictly on percentage change in the underlying stock. Such a list is quite misleading and can lead one to the wrong conclusions.

Example: There are two stocks with listed calls: NVS, which is not volatile, and VVS, which is quite volatile. Since a call on the volatile stock will be higher-priced than a call on the nonvolatile stock, the following prices might exist:

NVS:	40	VVS:	40
NVS July 40 call:	2	VVS July 40 call:	4

If these two calls are ranked for buying purposes, based strictly on a percentage change in the underlying stock, the NVS call will appear to be the better buy. For example, one might see a list such as "best call buys if the underlying stock advances by 10%." In this example, if each stock advanced 10% by expiration, both NVS and VVS would be at 44. Thus, the NVS July 40 would be worth 4, having doubled in price, for a 100% potential profit. Meanwhile, the VVS July 40 would be worth 4 also, for a 0% profit to the call buyer. This analysis would lead one to believe that the NVS July 40 is the better buy. Such a conclusion may be wrong, because an incorrect assumption was made in the ranking of the potentials of the two stocks. It is not right to assume that both stocks have the same probability of moving 10% by expiration. Certainly, the volatile stock has a much better chance of advancing by 10% (or more) than the nonvolatile stock does. *Any ranking based on equal percentage changes in the underlying stock, without regard for their volatilities, is useless and should be avoided.*

The correct method of comparing these two July 40 calls is to utilize the actual volatilities of the underlying stocks. Suppose that it is known that the volatile stock, VVS, could expect to move 15% in the time to July expiration. The nonvolatile stock, NVS, however, could only expect a move of 5% in the same period. Using this information, the call buyer can arrive at the conclusion that VVS July 40 is the better call to buy:

Stock Price in July	Call Price
VVS: 46 (up 15%)	VVS July 40: 6 (up 50%)
NVS: 42 (up 5%)	NVS July 40: 2 (unchanged)

By assuming that each stock can rise in accordance with its volatility, we can see that the VVS July 40 has the better reward potential, despite the fact that it was twice as expensive to begin with. This method of analysis is much more realistic.

One more refinement needs to be made in this ranking process. Since most call purchases are made for holding periods of from 30 to 90 days, it is not correct to assume that the calls will be held to expiration. That is, even if one buys a 6-month call, he will normally liquidate it, to take profits or cut losses, in 1 to 3 months. *The call buyer's list should thus be based on how the call will perform if held for a realistic time period, such as 90 days.*

Suppose the volatile stock in our example, VVS, has the potential to rise by 12% in 90 days, while the less volatile stock, NVS, has the potential of rising only 4% in 90 days. In 90 days, the July 40 calls will not be at parity, because there will be some time remaining until July expiration. Thus, it is necessary to attempt to predict what their prices will be at the end of the 90-day holding period. Assume that the following prices are accurate estimates of what the July 40 calls will be selling for in 90 days, if the underlying stocks advance in relation to their volatilities:

Stock Price in 90 Days	Call Price
VVS: 44.8 (up 12%)	VVS July 40: 6 (up 50%)
NVS: 41.6 (up 4%)	NVS July 40: 2½ (up 25%)

With some time remaining in the calls, they would both have time value premium at the end of 90 days. The bigger time premium would be in the VVS call, since the underlying stock is more volatile. Under this method of analysis, the VVS call is still the better one to buy.

The correct method of ranking potential reward situations for call buyers is as follows:

1. Assume each underlying stock can advance in accordance with its volatility over a fixed period (30, 60, or 90 days).
2. Estimate the call prices after the advance.
3. Rank all potential call purchases by highest percentage reward opportunity for aggressive purchases.
4. Assume each stock can decline in accordance with its volatility.
5. Estimate the call prices after the decline.
6. Rank all purchases by reward/risk ratio (the percentage gain from item 2 divided by the percentage loss from item 5).

The list from item 3 will generate more aggressive purchases because it incorporates potential rewards only. The list from item 6 would be a less speculative one. This method of analysis automatically incorporates the criteria set forth earlier, such as buying short-term out-of-the-money calls for aggressive purchases and buying longer-term in-the-money calls for a more conservative purchase. The delta is also a function of the volatility and is essentially incorporated by steps 1 and 4.

It is virtually impossible to perform this sort of analysis without a computer. The call buyer can generally obtain such a list from a brokerage firm or from a data service. For those individuals who have access to a computer and would like to generate

such an analysis for themselves, the details of computing a stock's volatility and predicting the call prices are provided in Chapter 28 on mathematical techniques.

OVERPRICED OR UNDERPRICED CALLS

Formulae exist that are capable of predicting what a call should be selling for, based on the relationship of the stock price and the striking price, the time remaining to expiration, and the volatility of the underlying stock. These are useful, for example, in performing the second step in the foregoing analysis, estimating the call price after an advance in the underlying stock. In reality, a call's actual price may deviate somewhat from the price computed by the formula. If the call is actually selling for more than the "fair" (computed) price, the call is said to be overvalued. An *undervalued* call is one that is actually trading at a price that is less than the "fair" price.

If the calls are truly overpriced, there may be a strategy that can help reduce their cost while still preserving upside profit potential. This strategy, however, requires the addition of a put spread to the call purchase, so it is beyond the scope of the subject matter at the current time. It is described in Chapter 23 on spreads combining calls and puts.

Generally, the amount by which a call is overvalued or undervalued may be only a small fraction of a point, such as 10 or 20 cents. In theory, the call buyer who purchases an undervalued call has gained a slight advantage in that the call should return to its "fair" value. However, in practice, this information is most useful only to market-makers or firm traders who pay little or no commissions for trading options. The general public cannot benefit directly from the knowledge that such a small discrepancy exists, because of commission costs.

One should not base his call buying decisions merely on the fact that a call is underpriced. It is small solace to the call buyer to find that he bought a "cheap" call that subsequently declined in price. The method of ranking calls for purchase that has been described does, in fact, give some slight benefit to underpriced calls. However, under the recommended method of analysis, a call will not automatically appear as an attractive purchase just because it is slightly undervalued.

TIME VALUE PREMIUM IS A MISNOMER

This is a topic that will be mentioned several times throughout the book, most notably in conjunction with volatility trading. It is introduced here because even the inexperienced option trader must understand that the portion of an option's price that is *not* intrinsic value – the part that we routinely call "time value premium" – is really composed of much more than just time value. Yes, time will eventually wear

away that portion of the option's price as expiration approaches. However, when an option has a considerable amount of time remaining until its expiration, the more important component of the option value is really volatility. If traders expect the underlying stock to be volatile, the option will be expensive; if they expect the opposite, the option will be cheap. This expensiveness and cheapness is reflected in the portion of the option that is not intrinsic value. For example, a six-month option will not decay much in one day's time, but a quick change in volatility expectations by option traders can heavily affect the price of the option, especially one with a good deal of time remaining. So an option buyer should carefully assess his purchases, not just view them as something that will waste away. With careful analysis, option buyers can do very well, if they consider what can happen *during* the life of the option, and not merely what will happen at expiration.

CALL BUYERS' FRUSTRATIONS

Despite one's best efforts, it may often seem that one does not make much money when a fairly volatile stock makes a quick move of 3 or 4 points. The reasons for this are somewhat more complex than can be addressed at this time, although they relate strongly to delta, time decay, and the volatility of the underlying stock. They are discussed in Chapter 36, "The Basics of Volatility Trading." If one plans to conduct a serious call buying strategy, he should read that chapter before embarking on a program of extensive call buying.

FOLLOW-UP ACTION

The simplest follow-up action that the call buyer can implement when the underlying stock drops is to sell his call and cut his losses. There is often a natural tendency to hold out hope that the stock can rally back to or above the striking price. Most of the time, the buyer does best by cutting his losses in situations in which the stock is performing poorly. He might use a "mental" stop price or could actually place a sell stop order, depending on the rules of the exchange where the call is traded. In general, stop orders for options result in poor executions, so using a "mental" stop is better. That is, one should base his exit point on the technical pattern of the underlying stock itself. If it should break down below support, for example, then the option holder should place a market (not held) order to sell his call option.

If the stock should rise, the buyer should be willing to take profits as well. Most buyers will quite readily take a profit if, for example, a call that was bought for 5 points had advanced to be worth 10 points. However, the same investor is often

reluctant to sell a call at 2 that he had previously bought for 1 point, because "I've only made a point." The similarity is clear – both cases resulted in approximately a 100% profit – and the investor should be as willing to accept the one as he is the other. This is not to imply that all calls that are bought at 1 should be sold when and if they get to 2, but the same factors that induce one to sell the 10-point call after doubling his money should apply to the 2-point call as well.

In fact, taking partial profits after a call holding has increased in value is often a wise plan. For example, if someone bought a number of calls at a price of 3, and they later were worth 5, it might behoove the call holder to sell one-third to one-half of his position at 5, thereby taking a partial profit. Having done that, it is often easier to let the profits run on the balance, and letting profits run is generally one of the keys to successful trading.

It is rarely to the call buyer's benefit to exercise the call if he has to pay commissions. When one exercises a call, he pays a stock commission to buy the stock at the striking price. Then when the stock is sold, a stock sale commission must also be paid. Since option commissions are much smaller, dollarwise, than stock commissions, the call holder will usually realize more net dollars by selling the call in the option market than by exercising it.

LOCKING IN PROFITS

When the call buyer is fortunate enough to see the underlying stock advance relatively quickly, he can implement a number of strategies to enhance his position. These strategies are often useful to the call buyer who has an unrealized profit but is torn between taking the profit or holding on in an attempt to generate more profits if the underlying stock should continue to rise.

Example: A call buyer bought an XYZ October 50 call for 3 points when the stock was at 48. Then the stock rises to 58. The buyer might consider selling his October 50 (which would probably be worth about 9 points) or possibly taking one of several actions, some of which might involve the October 60 call, which may be selling for 3 points. Table 3-1 summarizes the situation. At this point, the call buyer might take one of four basic actions:

1. Liquidate the position by selling the long call for a profit.
2. Sell the October 50 that he is currently long and use part of the proceeds to purchase October 60's.
3. Create a spread by selling the October 60 call against his long October 50.
4. Do nothing and remain long the October 50 call.

TABLE 3-1.
Present situation on XYZ October calls.

Original Trade		Current Prices	
XYZ common:	48	XYZ Common:	58
Bought XYZ October 50 at 3		XYZ October 50:	9
		XYZ October 60:	3

Each of these actions would produce different levels of risk and reward from this point forward. If the holder sells the October 50 call, he makes a 6-point profit, less commissions, and terminates the position. He can realize no further appreciation from the call, nor can he lose any of his current profits; he has realized a 6-point gain. *This is the least aggressive tactic of the four.* If the underlying stock continues to advance and rises above 63, any of the other three strategies will outperform the complete liquidation of the call. However, if the underlying stock should instead decline below 50 by expiration, this action would have provided the most profit of the four strategies.

The other simple tactic, the fourth one listed, is to do nothing. If the call is then held to expiration, *this tactic would be the riskiest of the four.* It is the only one that could produce a loss at expiration if XYZ fell back below 50. However, if the underlying stock continues to rise in price, more profits would accrue on the call. Every call buyer realizes the ramifications of these two tactics – liquidating or doing nothing – and is generally looking for an alternative that might allow him to reduce some of his risk without cutting off his profit potential completely. The remaining two tactics are geared to this purpose: limiting the total risk while providing the opportunity for further profits of an amount greater than those that could be realized by liquidating.

The strategy in which the holder sells the call that he is currently holding, the October 50, and uses part of the proceeds to buy the call at the next higher strike is called *rolling up.* In this example, he could sell the October 50 at 9, pocket his initial 3-point investment, and use the remaining proceeds to buy two October 60 calls at 3 points each. Thus, it is sometimes possible for the speculator to recoup his entire original investment and still increase the number of calls outstanding by rolling up. Once this has been done, the October 60 calls will represent pure profits, whatever their price. *The buyer who "rolls up" in this manner is essentially speculating with someone else's money.* He has put his own money back in his pocket and is using accrued profits to attempt to realize further gains. At expiration, this tactic would perform best if XYZ increased by a substantial amount. This tactic turns out to be the

worst of the four at expiration if XYZ remains near its current price, staying above 53 but not rising above 63 in this example.

The other alternative, the third one listed, is to continue to hold the October 50 call but to sell the October 60 call against it. This would create what is known as a bull spread, and the tactic can be used only by traders who have a margin account and can meet their firm's minimum equity requirement for spreading (generally $2,000). This spread position has no risk, for the long side of the spread – the October 50 – cost 3 points, and the short side of the spread – the October 60 – brought in 3 points via its sale. Even if the underlying stock drops below 50 by expiration and all the calls expire worthless, the trader cannot lose anything except commissions. On the other hand, the maximum potential of this spread is 10 points, the difference between the striking prices of 50 and 60. This maximum potential would be realized if XYZ were anywhere above 60 at expiration, for at that time the October 50 call would be worth 10 points more than the October 60 call, regardless of how far above 60 the underlying stock had risen. *This strategy will be the best performer of the four if XYZ remains relatively unchanged,* above the lower strike but not much above the higher strike by expiration. It is interesting to note that this tactic is *never the worst performer of the four tactics,* no matter where the stock is at expiration. For example, if XYZ drops below 50, this strategy has no risk and is therefore better than the "do nothing" strategy. If XYZ rises substantially, this spread produces a profit of 10 points, which is better than the 6 points of profit offered by the "liquidate" strategy.

There is no definite answer as to which of the four tactics is the best one to apply in a given situation. However, if a call can be sold against the currently long call to produce a bull spread that has little or no risk, it may often be an attractive thing to do. It can never turn out to be the worst decision, and it would produce the largest profits if XYZ does not rise substantially or fall substantially from its current levels. Tables 3-2 and 3-3 summarize the four alternative tactics, when a call holder has an unrealized profit. The four tactics, again, are:

1. "Do nothing" – continue to hold the currently long call.
2. "Liquidate" – sell the long call to take profits and do not reinvest.
3. "Roll up" – sell the long call, pocket the original investment, and use the remaining proceeds to purchase as many out-of-the-money calls as possible.
4. "Spread" – create a bull spread by selling the out-of-the-money call against the currently profitable long call, preferably taking in at least the original cost of the long call.

TABLE 3-2.
Comparison of the four alternative strategies.

If the underlying stock then...	The best tactic was...	And the worst tactic was...
continues to rise dramatically ...	"roll up"	liquidate
rises moderately above the next strike ...	do nothing	liquidate or "roll up"
remains relatively unchanged ...	spread	"roll up"
falls back below the original strike...	liquidate	do nothing

TABLE 3-3.
Results at expiration.

XYZ Price at Expiration	"Roll-up" Profit	"Do Nothing" Profit	"Spread" Profit	Liquidating Profit
50 or below	$ 0	–$ 300(W)	$ 0	+$600(B)
53	0(W)	0(W)	+ 300	+ 600(B)
56	0(W)	+ 300	+ 600(B)	+ 600(B)
60	0(W)	+ 700	+ 1,000(B)	+ 600
63	+ 600(W)	+ 1,000(B)	+ 1,000(B)	+ 600(W)
67	+ 1,400(B)	+ 1,400(B)	+ 1,000	+ 600(W)
70	+ 2,000(B)	+ 1,700	+ 1,000	+ 600(W)

Note that each of the four tactics proves to be the best tactic in one case or another, but that the spread tactic is never the worst one. Tables 3-2 and 3-3 represent the results from holding until expiration. For those who prefer to see the actual numbers involved in making these comparisons between the four tactics, Table 3-3 summarizes the potential profits and losses of each of the four tactics using the prices from the example above. "W" indicates that the tactic is the worst one at that price, and "B" indicates that it is the best one.

There are, of course, modifications that an investor might make to any of these tactics. For example, he might decide to sell out half of his long call position, recovering a major part of his original cost, and continue to hold the remainder of the long calls. This still leaves room for further appreciation.

DEFENSIVE ACTION

Two follow-up strategies are sometimes employed by the call buyer when the underlying stock declines in price. Both involve spread strategies; that is, being long and short two different calls on the same underlying stock simultaneously. Spreads are discussed in detail in later chapters. This discussion of spreads applies only to their use by the call buyer.

"Rolling Down." If an option holder owns an option at a currently unrealized loss, it may be possible to greatly increase the chances of making a limited profit on a relatively small rebound in the stock price. In certain cases, the investor may be able to implement such a strategy at little or no increase in risk.

Many call buyers have encountered a situation such as this: An XYZ October 35 call was originally bought for 3 points in hopes of a quick rise in the stock price. However, because of downward movements in the stock – to 32, say – the call is now at $1\frac{1}{2}$ with October expiration nearer. If the call buyer still expects a mild rally in the stock before expiration, he might either hold the call or possibly "average down" (buy more calls at $1\frac{1}{2}$). In either case he will need a rally to nearly 38 by expiration in order to break even. Since this would necessitate at least a 15% upward move by the stock before expiration, it cannot be considered very likely. Instead, the buyer should consider implementing the following strategy, which will be explained through the use of an example.

Example: The investor is long the October 35 call at this time:

XYZ, 32;

XYZ October 35 call, $1\frac{1}{2}$; and

XYZ October 30 call, 3.

One could sell two October 35's and, at the same time, buy one October 30 for no additional investment before commissions. That is, the sale of 2 October 35's at $150 each would bring in $300, exactly the cost, before commissions, of buying the October 30 call. *This is the key to implementing the roll-down strategy: that one be able to buy the lower strike call and sell two of the higher strike calls for nearly even money.*

Note that the investor is now short the call that he previously owned, the October 35. Where he previously owned one October 35, he has now sold two of them. He is also now long one October 30 call. Thus, his position is:

long 1 XYZ October 30 call,
short 1 XYZ October 35 call.

This is technically known as a *bull spread*, but the terminology is not important. Table 3-4 summarizes the transactions that the buyer has made to acquire this spread. The trader now "owns" the spread at a cost of $300, plus commissions. By making this trade, he has lowered his break-even point significantly without increasing his risk. However, the maximum profit potential has also been limited; he can no longer capitalize on a strong rebound by the underlying stock.

In order to see that the break-even point has been lowered, consider what the results are if XYZ is at 33 at October expiration. The October 30 call would be worth 3 points and the October 35 would expire worthless with XYZ at 33. Thus, the October 30 call could be sold to bring in $300 at that time, and there would not be any expense to buy back the October 35. Consequently, the spread could be liquidated for $300, exactly the amount for which it was "bought." The spread then breaks even at 33 at expiration. If the call buyer had not rolled down, his break-even point would be 38 at expiration, for he paid 3 points for the original October 35 call and he would thus need XYZ to be at 38 in order to be able to liquidate the call for 3 points. Clearly, the stock has a better chance of recovering to 33 than to 38. *Thus, the call buyer significantly lowers his break-even point by utilizing this strategy.*

Lowering the break-even point is not the investor's only concern. He must also be aware of what has happened to his profit and loss opportunities. The risk remains essentially the same – the $300 in debits, plus commissions, that has been paid out. The risk has actually increased slightly, by the amount of the commissions spent in "rolling down." However, the stock price at which this maximum loss would be realized has been lowered. With the original long call, the October 35, the buyer would lose the entire $300 investment anywhere below 35 at October expiration. The

TABLE 3-4.
Transactions in bull spread.

	Trade	Cost before Commissions
Original trade	Buy 1 October 35 call at 3	$300 debit
Later trade	Sell 2 October 35 calls at $1\frac{1}{2}$	$300 credit
	Buy 1 October 30 call at 3	$300 debit
Net position	Long 1 October 30 call	$300 debit
	Short 1 October 35 call	

spread strategy, however, would result in a total loss of $300 only if XYZ were below 30 at October expiration. With XYZ above 30 in October, the long side of the spread could be liquidated for some value, thereby avoiding a total loss. *The investor has reduced the chance of realizing the maximum loss,* since the stock price at which that loss would occur has been lowered by 5 points.

As with most investments, the improvement of risk exposure – lowering the break-even point and lowering the maximum loss price – necessitates that some potential reward be sacrificed. In the original long call position (the October 35), the maximum profit potential was unlimited. In the new position, the potential profit is limited to 2 points if XYZ should rally back to, *or anywhere above,* 35 by October expiration. To see this, assume XYZ is 35 at expiration. Then the long October 30 call would be worth 5 points, while the October 35 would expire worthless. Thus, the spread could be liquidated for 5 points, a 2-point profit over the 3 points paid for the spread. This is the limit of profit for the spread, however, since if XYZ is above 35 at expiration, any further profits in the long October 30 call would be offset by a corresponding loss on the short October 35 call. *Thus, if XYZ were to rally heavily by expiration, the "rolled down" position would not realize as large a profit as the original long call position would have realized.*

Table 3-5 and Figure 3-2 summarize the original and new positions. Note that the new position is better for stock prices between 30 and 40. Below 30, the two positions are equal, except for the additional commissions spent. If the stock should rally back above 40, the original position would have worked out better. *The new position is an improvement, provided that XYZ does not rally back above 40 by expiration.* The chances that XYZ could rally 8 points, or 25%, from 32 to 40 would have to be considered relatively remote. Rolling the long call down into the spread would thus appear to be the correct thing to do in this case.

This example is particularly attractive, because no additional money was required to establish the spread. In many cases, however, one may find that the long call cannot be rolled into the spread at even money. Some debit may be required. This fact should not necessarily preclude making the change, since a small additional investment may still significantly increase the chance of breaking even or making a profit on a rebound.

Example: The following prices now exist, rather than the ones used earlier. Only the October 30 call price has been altered:

XYZ, 32;

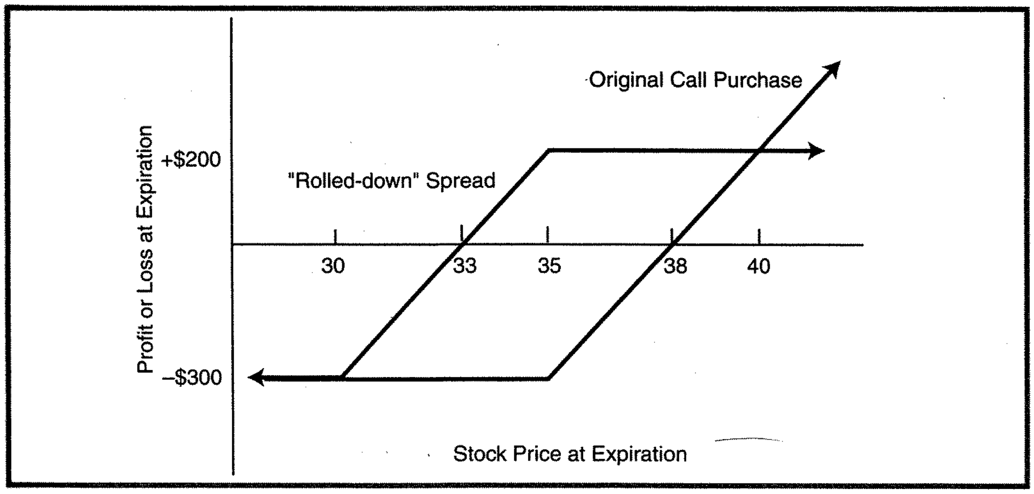
XYZ October 35 call, $1\frac{1}{2}$; and

XYZ October 30 call, 4.

TABLE 3-5.
Original and spread positions compared.

Stock Price at Expiration	Long Call Result	Spread Result
25	–$300	–$300
30	– 300	– 300
33	– 300	0
35	– 300	+ 200
38	0	+ 200
40	+ 200	+ 200
45	+ 700	+ 200

FIGURE 3-2.
Companion: original call purchase vs. spread.



With these prices, a 1-point debit would be required to roll down. That is, selling 2 October 35 calls would bring in $300 ($150 each), but the cost of buying the October 30 call is $400. Thus, the transaction would have to be done at a cost of $100, plus commissions. With these prices, the break-even point after rolling down would be 34, still well below the original break-even price of 38. The risk has now been increased by the additional 1 point spent to roll down. If XYZ should drop below 30 at October expiration, the investor would have a total loss of 4 points plus commissions. The maximum loss with the original long October 35 call was limited to 3 points plus a smaller amount of commissions. Finally, the maximum amount of money that the

spread could make is now \$100, less commissions. The alternative in this example is not nearly as attractive as the previous one, but it might still be worthwhile for the call buyer to invoke such a spread if he feels that XYZ has limited rally potential up to October expiration.

One should not automatically discard the use of this strategy merely because a debit is required to convert the long call to a spread. Note that to "average down" by buying an additional October 35 call at 1½ would require an additional investment of \$150. This is more than the \$100 required to convert into the spread position in the immediately preceding example. The break-even point on the position that was "averaged down" would be over 37 at expiration, whereas the break-even point on the spread is 34. Admittedly, the averaged-down position has much more profit potential than the spread does, but the conversion to the spread is less expensive than "averaging down" and also provides a lower break-even price.

In summary, then, if the call buyer finds himself with an unrealized loss because the stock has declined, and yet is unwilling to sell, he may be able to improve his chances of breaking even by "rolling down" into a spread. That is, he would sell 2 of the calls that he is currently long – the one that he owns plus another one – and simultaneously buy one call at the next lower striking price. If this transaction of selling 2 calls and buying 1 call can be done for approximately even money, it could definitely be to the buyer's benefit to implement this strategy, because the break-even point would be lowered considerably and the buyer would have a much better chance of getting out even or making a small profit should the underlying stock have a small rebound.

Creating a Calendar Spread. A different type of defensive spread strategy is sometimes used by the call buyer who finds that the underlying stock has declined. In this strategy, the holder of an intermediate- or long-term call sells a near-term call, with the same striking price as the call he already owns. This creates what is known as a calendar spread. The idea behind doing this is that if the short-term call expires worthless, the overall cost of the long call will be reduced to the buyer. Then, if the stock should rally, the call buyer has a better chance of making a profit.

Example: Suppose that an investor bought an XYZ October 35 call for 3 points sometime in April. By June the stock has fallen to 32, and it appears that the stock might remain depressed for a while longer. The holder of the October 35 call might consider selling a July 35 call, perhaps for a price of 1 point. Should XYZ remain below 35 until *July* expiration, the short call would expire worthless, earning a small, 1-point profit. The investor would still own the October 35 call and would then hope for a rally by XYZ before October in order to make profits on that call. Even if XYZ does

not rally by October, he has decreased his overall loss by the amount received for the sale of the July 35 call.

This strategy is not as attractive to use as the previous one. If XYZ should rally before July expiration, the investor might find himself with two losing positions. For example, suppose that XYZ rallied back to 36 in the next week. His short call that he sold for 1 point would be selling for something more than that, so he would have an unrealized loss on the short July 35. In addition, the October 35 would probably not have appreciated back to its original price of 3, and he would therefore have an unrealized loss on that side of the spread as well.

Consequently, this strategy should be used with great caution, for if the underlying stock rallies quickly before the near-term expiration, the spread could be at a loss on both sides. Note that in the former spread strategy, this could not happen. Even if XYZ rallied quickly, some profit would be made on the rebound.

A FURTHER COMMENT ON SPREADS

Anyone not familiar with the margin requirements for spreads, under both the exchange margin rules and the rules of the brokerage firm he is dealing with, should not attempt to utilize a spread transaction. Later chapters on spreads outline the more common requirements for spread transactions. In general, one must have a margin account to establish a spread and must have a minimum amount of equity in the account. Thus, the call buyer who operates in a cash account cannot necessarily use these spread strategies. To do so might incur a margin call and possible restriction of one's trading account. Therefore, check on specific requirements before utilizing a spread strategy. Do not assume that a long call can automatically be "rolled" into any sort of spread.

CHAPTER 4

Other Call Buying Strategies

In this chapter, two additional strategies that utilize the purchase of call options are described. Both of these strategies involve buying calls against the short sale of the underlying stock. When listed puts are traded on the underlying stock, these strategies are often less effective than when they are implemented with the use of put options. However, the concept is important, and sometimes these strategies are more viable in markets where calls are very liquid but puts are not. These strategies are generally known as "synthetic" strategies.

THE PROTECTED SHORT SALE (OR SYNTHETIC PUT)

Purchasing a call at the same time that one is short the underlying stock is a means of limiting the risk of the short sale to a fixed amount. Since the risk is theoretically unlimited in a short sale, many investors are reluctant to use the strategy. Even for those investors who do sell stock short, it can be rather upsetting if the stock rises in price. One may be forced into an emotional – and perhaps incorrect – decision to cover the short sale in order to relieve the psychological pressure. By owning a call at the same time he is short, the investor limits the risk to a fixed and generally small amount.

Example: An investor sells XYZ short at 40 and simultaneously purchases an XYZ July 40 call for 3 points. If XYZ falls in price, the short seller will make his profit on the short sale, less the 3 points paid for the call, which will expire worthless. *Thus, by buying the call for protection, a small amount of profit potential is sacrificed.* However, the advantage of owning the call is demonstrated when the results are examined for a stock rise. If XYZ should rise to any price above 40 by July expiration,

the short seller can cover his short by exercising the long call and buying stock at 40. Thus, the maximum risk that the short seller can incur in this example is the 3 points paid for the call. Table 4-1 and Figure 4-1 depict the results at expiration from utilizing this strategy. Commissions are not included. Note that the break-even point is 37 in this example. That is, if the stock drops 3 points, the protected short sale position will break even because of the 3-point loss on the call. The short seller who did not spend the extra money for the long call would, of course, have a 3-point profit at 37. To the upside, however, the protected short sale outperforms a regular short sale if the stock climbs anywhere above 43. At 43, both types of short sales have $300 losses. But above that level, the loss would continue to grow for a regular short sale, while it is fixed for the short seller who also bought a call. In either case, the short seller's risk is increased slightly by the fact that he is obligated to pay out the dividends on the underlying stock, if any are declared.

A simple formula is available for determining the maximum amount of risk when one protects a short sale by buying a call option:

Risk = Striking price of purchased call + Call price – Stock price

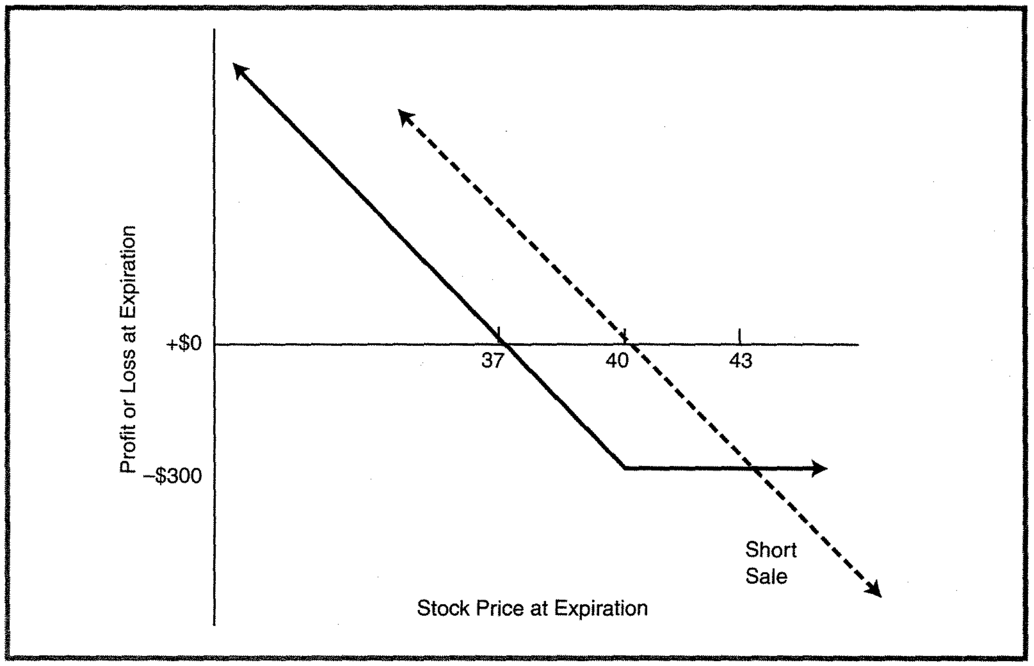
Depending on how much risk the short seller is willing to absorb, he might want to buy an out-of-the-money call as protection rather than an at-the-money call, as was shown in the example above. A smaller dollar amount is spent for the protection when one buys an out-of-the-money call, so that the short seller does not give away as much of his profit potential. However, his risk is larger because the call does not start its protective qualities until the stock goes above the striking price.

Example: With XYZ at 40, the short seller of XYZ buys the July 45 call at ½ for protection. His maximum possible loss, if XYZ is above 45 at July expiration, would be

TABLE 4-1.
Results at expiration—protected short sale.

XYZ Price at Expiration	Profit on XYZ	Call Price at Expiration	Profit on Call	Total Profit
20	+$2,000	0	–$ 300	+$1,700
30	+ 1,000	0	– 300	+ 700
37	+ 300	0	– 300	0
40	0	0	– 300	– 300
50	– 1,000	10	+ 700	– 300
60	– 2,000	20	+ 1,700	– 300

FIGURE 4-1.
Protected short sale.



5½ points – the five points between the current stock price of 40 and the striking price of 45, plus the amount paid for the call. On the other hand, if XYZ declines, the protected short seller will make nearly as much as the short seller who did not protect, since he only spent ½ point for the long call.

If one buys an *in-the-money* call as protection for the short sale, his risk will be quite minimal. However, his profit potential will be severely limited. As an example, with XYZ at 40, if one had purchased a July 35 call at 5½, his risk would be limited to ½ point anywhere above 35 at July expiration. Unfortunately, he would not realize any profit on the position until the stock went below 34½, a drop of 5½ points. This is too much protection, for it limits the profit so severely that there is only a small hope of making a profit.

Generally, it is best to buy a call that is at-the-money or only slightly out-of-the-money as the protection for the short sale. It is not of much use to buy a deeply out-of-the-money call as protection, since it does very little to moderate risk unless the stock climbs quite dramatically. Normally, one would cover a short sale before it went heavily against him. Thus, the money spent for such a deeply out-of-the-money call is wasted. However, if one wants to give a short sale plenty of room to "work" and

feels very certain that his bearish view of the stock is the correct view, he might then buy a fairly deep out-of-the-money call just as disaster protection, in case the stock suddenly bolted upward in price (if it received a takeover bid, for example).

MARGIN REQUIREMENTS

The newest margin rules now allow one to receive favorable margin treatment when a short sale of stock is protected by a long call option. The margin required is the lower of (1) 10% of the call's striking price plus any out-of-the-money amount, or (2) 30% of the current short stock's market value. The position will be marked to market daily, and most brokers will require that the short sale be margined at "normal" rates if the stock is below the strike price.

Example: Suppose the following prices exist:

XYZ Common stock: 47

Oct 40 call: 8

Oct 50 call: 3

Oct 60 call: 1

Suppose that one is considering a short sale of 100 shares of XYZ at 47 and the purchase of one of the calls as protection. Here are the margin requirements for the various strike prices. (Note that the option price, per se, is not part of the margin requirement, but all options must be paid for in full, initially).

Position	10% strike + out-of-the-money	30% stock price
Short XYZ, long Oct 40 call	400 + 0 = 400*	1,410
Short XYZ, long Oct 50 call	500 + 300 = 800*	1,410
Short XYZ, long Oct 60 call	600 + 1,300 = 1,900	1,410*

*Since the margin requirement is the *lower* of the two figures, the items marked with an asterisk in this table are the margin requirements.

Again, remember that the long call would have to be paid for in full, and that most brokers impose a maintenance requirement of at least the value of the short sale itself as long as the stock is below the strike price of the long call, in addition to the above requirements.

FOLLOW-UP ACTION

There is little that the protected short seller needs to perform in the way of follow-up action in this strategy, other than closing out the position. If the underlying stock moves down quickly and it appears that it might rebound, the short sale could be covered without selling the long call. In this manner, one could potentially profit on the call side as well if the stock came back above the original striking price. If the underlying stock rises in price, a similar strategy of taking off only the profitable call side of the transaction is not recommended. That is, if XYZ climbed from 40 to 50 and the July 40 call also rose from 3 to 10, it is not advisable to take the 7-point profit in the call, hoping for a drop in the stock price. The reason for this is that one is entering into a highly risk-oriented situation by removing his protection when the call is in-the-money. Thus, when the stock drops, it is all right – perhaps even desirable – to take the profit, because there is little or no additional risk if the stock continues to drop. However, when the stock *rises*, it is *not* an equivalent situation. In that case, if the short seller sells his call for a profit and the stock subsequently rises even further, large losses could result.

It may often be advisable to close the position if the call is at or near parity, in-the-money, by exercising the call. In most strategies, the option holder has no advantage in exercising the call because of the large dollar difference between stock commissions and option commissions. However, in the protected short sale strategy, the short seller is eventually going to have to cover the short stock in any case and incur the stock commission by so doing. It may be to his advantage to exercise the call and buy his stock at the striking price, thereby buying stock at a lower price and perhaps paying a slightly lower commission amount.

Example: XYZ rises to 50 from the original short sale price of 40, and the XYZ July 40 call is selling at 10 somewhere close to expiration. The position could be liquidated by either (1) buying the stock back at 50 and selling the call at 10, or (2) exercising the call to buy stock at 40. In the first case, one would pay a stock commission at a price of $50 per share plus an option commission on a $10 option. In the second case, the only commission would be a stock commission at the price of $40 per share. Since both actions accomplish the same end result – closing the position entirely for 40 points plus commissions – clearly the second choice is less costly and therefore more desirable. Of course, if the call has time value premium in it of an amount greater than the commission savings, the first alternative should be used.

THE REVERSE HEDGE (SIMULATED STRADDLE)

There is another strategy involving the purchase of long calls against the short sale of stock. In this strategy, one purchases calls on more shares than he has sold short. The strategist can profit if the underlying stock rises far enough or falls far enough during the life of the calls. This strategy is generally referred to as a *reverse hedge* or *simulated straddle.* On stocks for which listed puts are traded, this strategy is outmoded; the same results can be better achieved by buying a straddle (a call and a put). Hence, the name "simulated straddle" is applied to the reverse hedge strategy.

This strategy has limited loss potential, usually amounting to a moderate percentage of the initial investment, *and theoretically unlimited profit potential.* When properly selected (selection criteria are described in great detail in Chapter 36, which deals with volatility trading), the percentage of success can be quite high in straddle or synthetic straddle buying. These features make this an attractive strategy, especially when call premiums are low in comparison to the volatility of underlying stock.

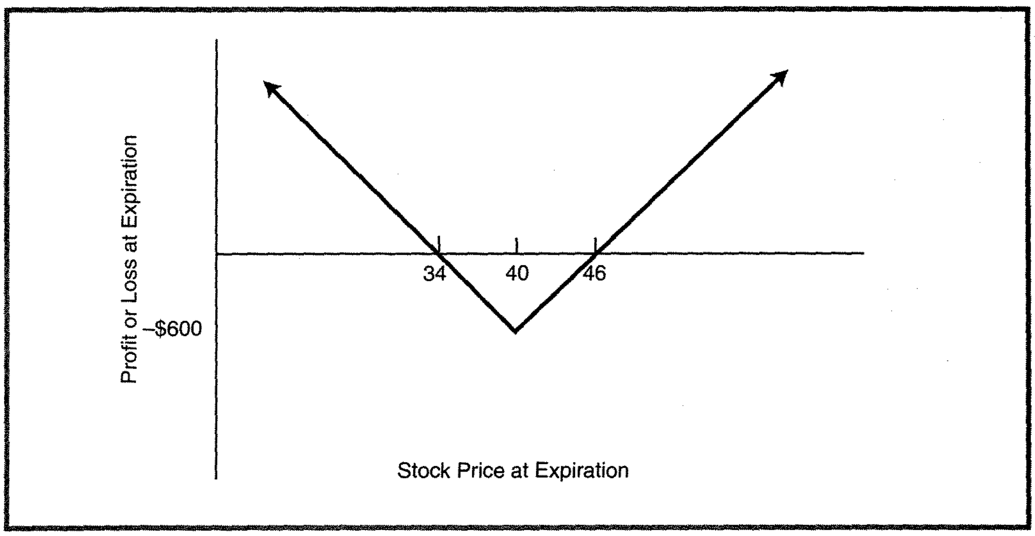
Example: XYZ is at 40 and an investor believes that the stock has the potential to move by a relatively large distance, but he is not sure of the direction the stock will take. This investor could short XYZ at 40 and buy 2 XYZ July 40 calls at 3 each to set up a reverse hedge. If XYZ moves up by a large distance, he will incur a loss on his short stock, but the fact that he owns two calls means that the call profits will outdistance the stock loss. If, on the other hand, XYZ drops far enough, the short sale profit will be larger than the loss on the calls, which is limited to 6 points. Table 4-2 and Figure 4-2 show the possible outcomes for various stock prices at July expiration. If XYZ falls, the stock profits on the short sale will accumulate, but the loss on the two calls is limited to \$600 (3 points each) so that, below 34, the reverse hedge can make ever-increasing profits. To the upside, even though the short sale is incurring losses, the call profits grow faster because there are two long calls. For example, at 60 at expiration, there will be a 20-point (\$2,000) loss on the short stock, but each XYZ July 40 call will be worth 20 points with the stock at 60. Thus, the two calls are worth \$4,000, representing a profit of \$3,400 over the initial cost of \$600 for the calls.

Table 4-2 and Figure 4-2 illustrate another important point: *The maximum loss would occur if the stock were exactly at the striking price at expiration of the calls.* This maximum loss would occur if XYZ were at 40 at expiration and would amount to \$600. In actual practice, since the short seller must pay out any dividends paid by the underlying stock, the risk in this strategy is increased by the amount of such dividends.

TABLE 4-2.
Reverse hedge at July expiration.

XYZ Price at Expiration	Stock Profit	Profit on 2 Calls	Total Profit
20	+$2,000	−$ 600	+$1,400
25	+ 1,500	− 600	+ 900
30	+ 1,000	− 600	+ 400
34	+ 600	− 600	0
40	0	− 600	− 600
46	− 600	+ 600	0
50	− 1,000	+ 1,400	+ 400
55	− 1,500	+ 2,400	+ 900
60	− 2,000	+ 3,400	+ 1,400

FIGURE 4-2.
Reverse hedge (simulated straddle).



The net margin required for this strategy is 50% of the underlying stock plus the full purchase price of the calls. In the example above, this would be an initial investment of $2,000 (50% of the stock price) plus $600 for the calls, or $2,600 total plus commissions. The short sale is marked to market, so the collateral requirement would grow if the stock rose. Since the maximum risk, before commissions, is $600, this means that the net percentage risk in this transaction is $600/$2,600, about 23%.

This is a relatively small percentage risk in a position that could have very large profits. There is also very little chance that the entire maximum loss would ever be realized since it occurs only at one specific stock price. One should not be deluded into thinking that this strategy is a sure money-maker. In general, stocks do not move very far in a 3- or 6-month period. With careful selection, though, one can often find situations in which the stock will be able to move far enough to reach the break-even points. Even when losses are taken, they are counterbalanced by the fact that significant gains can be realized when the stock moves by a great distance.

It is obvious from the information above that profits are made if the stock moves far enough in either direction. In fact, one can determine exactly the prices beyond which the stock would have to move by expiration in order for profits to result. These prices are 34 and 46 in the foregoing example. The downside break-even point is 34 and the upside break-even point is 46. These break-even points can easily be computed. First, the maximum risk is computed. Then the break-even points are determined.

Maximum risk = Striking price + 2 × Call price – Stock price
Upside break-even point = Striking price + Maximum risk
Downside break-even point = Striking price – Maximum risk

In the preceding example, the striking price was 40, the stock price was also 40, and the call price was 3. Thus, the maximum risk = 40 + 2 × 3 – 40 = 6. This confirms that the maximum risk in the position is 6 points, or \$600. The upside break-even point is then 40 + 6, or 46, and the downside break-even point is 40 – 6, or 34. These also agree with Table 4-2 and Figure 4-2.

Before expiration, profits can be made even closer to the striking price, because there will be some time value premium left in the purchased calls.

Example: If XYZ moved to 45 in one month, each call might be worth 6. If this happened, the investor would have a 5-point loss on the stock, but would also have a 3-point gain on each of the two options, for a net overall gain of 1 point, or \$100. Before expiration, the break-even point is clearly somewhere below 46, because the position is at a profit at 45.

Ideally, one would like to find relatively underpriced calls on a fairly volatile stock in order to implement this strategy most effectively. These situations, while not prevalent, **can** be found. Normally, call premiums quite accurately reflect the volatility of the underlying stock. Still, this strategy can be quite viable, because nearly every stock, regardless of its volatility, occasionally experiences a straight-line, fairly large move. It is during these times that the investor can profit from this strategy.

Generally, the underlying stock selected for the reverse hedge should be volatile. Even though option premiums are larger on these stocks, they can still be outdistanced by a straight-line move in a volatile situation. Another advantage of utilizing volatile stocks is that they generally pay little or no dividends. This is desirable for the reverse hedge, because the short seller will not be required to pay out as much.

The technical pattern of the underlying stock can also be useful when selecting the position. One generally would like to have little or no technical support and resistance within the loss area. This pattern would facilitate the stock's ability to make a fairly quick move either up or down. It is sometimes possible to find a stock that is in a wide trading range, frequently swinging from one side of the range to the other. If a reverse hedge can be set up that has its loss area well within this trading range, the position may also be attractive.

Example: The XYZ stock in the previous example is trading in the range 30 to 50, perhaps swinging to one end and then the other rather frequently. Now the reverse hedge example position, which would make profits above 46 or below 34, would appear more attractive.

FOLLOW-UP ACTION

Since the reverse hedge has a built-in limited loss feature, it is not necessary to take any follow-up action to avoid losses. The investor could quite easily put the position on and take no action at all until expiration. This is often the best method of follow-up action in this strategy.

Another follow-up strategy can be applied, although it has some disadvantages associated with it. This follow-up strategy is sometimes known as *trading against the straddle*. When the stock moves far enough in either direction, the profit on that side can be taken. Then, if the stock swings back in the opposite direction, a profit can also be made on the other side. Two examples will show how this type of follow-up strategy works.

Example 1: The XYZ stock in the previous example quickly moves down to 32. At that time, an 8-point profit could be taken on the short sale. This would leave two long calls. Even if they expired worthless, a 6-point loss is all that would be incurred on the calls. Thus, the entire strategy would still have produced a profit of 2 points. However, if the stock should rally above 40, profits could be made on the calls as well. A slight variation would be to sell one of the calls at the same time the stock profit is taken. This would result in a slightly larger realized profit; but if the stock rallied back

above 40, the resulting profits there would be smaller because the investor would be long only one call instead of two.

Example 2: XYZ has moved up to a price at which the calls are each worth 8 points. One of the calls could then be sold, realizing a 5-point profit. The resulting position would be short 100 shares of stock and long one call, a protected short sale. The protected short sale has a limited risk, above 40, of 3 points (the stock was sold short at 40 and the call was purchased for 3 points). Even if XYZ remains above 40 and the maximum 3-point loss has to be taken, the overall reverse hedge would still have made a profit of 2 points because of the 5-point profit taken on the one call. Conversely, if XYZ drops below 40, the protected short sale position could add to the profits already taken on the call.

There is a variation of this upside protective action.

Example 3: Instead of selling the one call, one could instead short an additional 100 shares of stock at 48. If this was done, the overall position would be short 200 shares of stock (100 at 40 and the other 100 at 48) and long two calls – again a protected short sale. If XYZ remained above 40, there would again be an overall gain of 2 points. To see this, suppose that XYZ was above 40 at expiration and the two calls were exercised to buy 200 shares of stock at 40. This would result in an 8-point profit on the 100 shares sold short at 48, and no gain or loss on the 100 shares sold short at 40. The initial call cost of 6 points would be lost. Thus, the overall position would profit by 2 points. This means of follow-up action to the upside is more costly in commissions, but would provide bigger profits if XYZ fell back below 40, because there are 200 shares of XYZ short.

In theory, if any of the foregoing types of follow-up action were taken and the underlying stock did indeed reverse direction and cross back through the striking price, the original position could again be established. Suppose that, after covering the short stock at 32, XYZ rallied back to 40. Then XYZ could be sold short again, reestablishing the original position. If the stock moved outside the break-even points again, further follow-up action could be taken. This process could theoretically be repeated a number of times. If the stock continued to whipsaw back and forth in a trading range, the repeated follow-up actions could produce potentially large profits on a small net change in the stock price. In actual practice, it is unlikely that one would be fortunate enough to find a stock that moved that far that quickly.

The disadvantage of applying these follow-up strategies is obvious: *One can never make a large profit if he continually cuts his profits off at a small, limited*

amount. When XYZ falls to 32, the stock can be covered to ensure an overall profit of 2 points on the transaction. However, if XYZ continued to fall to 20, the investor who took no follow-up action would make 14 points while the one who did take follow-up action would make only 2 points. Recall that it was stated earlier that there is a high probability of realizing limited losses in the reverse hedge strategy, but that this is balanced by the potentially large profits available in the remaining cases. If one takes follow-up action and cuts off these potentially large profits, he is operating at a distinct disadvantage unless he is an extremely adept trader.

Proponents of using the follow-up strategy often counter with the argument that it is frustrating to see the stock fall to 32 and then return back to nearly 40 again. If no follow-up action were taken, the unrealized profit would have dissolved into a loss when the stock rallied. This is true as far as it goes, but it is not an effective enough argument to counterbalance the negative effects of cutting off one's profits.

ALTERING THE RATIO OF LONG CALLS TO SHORT STOCK

Another aspect of this strategy should be discussed. One does not have to buy exactly two calls against 100 shares of short stock. More bullish positions could be constructed by buying three or four calls against 100 shares short. More bearish positions could be constructed by buying three calls and shorting 200 shares of stock. One might adopt a ratio other than 2:1, because he is more bullish or bearish. He also might use a different ratio if the stock is between two striking prices, but he still wants to create a position that has break-even points spaced equidistant from the current stock price. A few examples will illustrate these points.

Example: XYZ is at 40 and the investor is slightly bullish on the stock but still wants to employ the reverse hedge strategy, because he feels there is a chance the stock could drop sharply. He might then short 100 shares of XYZ at 40 and buy 3 July 40 calls for 3 points apiece. Since he paid 9 points for the calls, his maximum risk is that 9 points if XYZ were to be at 40 at expiration. This means his downside break-even price is 31, for at 31 he would have a 9-point profit on the short sale to offset the 9-point loss on the calls. To the upside, his break-even is now $44\frac{1}{2}$. If XYZ were at $44\frac{1}{2}$ and the calls at $4\frac{1}{2}$ each at expiration, he would lose $4\frac{1}{2}$ points on the short sale, but would make $1\frac{1}{2}$ on each of the three calls, for a total call profit of $4\frac{1}{2}$.

A more bearish investor might short 200 XYZ at 40 and buy 3 July 40 calls at 3. His break-even points would be $35\frac{1}{2}$ on the downside and 49 on the upside, and his maximum risk would be 9 points. There is a general formula that one can always

apply to calculate the maximum risk and the break-even points, regardless of the ratios involved.

$$\text{Maximum risk} = (\text{Striking price} - \text{Stock price}) \times \text{Round lots shorted} + \text{Number of calls bought} \times \text{Call price}$$

$$\text{Upside break-even} = \text{Striking price} + \frac{\text{Maximum risk}}{(\text{Number of calls bought} - \text{Number of round lots short})}$$

$$\text{Downside break-even} = \text{Striking price} - \frac{\text{Maximum risk}}{\text{Number of round lots short}}$$

To verify this, use the numbers from the example in which 100 XYZ were shorted at 40 and three July 40 calls were purchased for 3 each.

$$\text{Maximum risk} = (40 - 40) \times 1 + 3 \times 3 = 9$$
$$\text{Upside break-even} = 40 + 9/(3 - 1) = 40 + 4\tfrac{1}{2} = 44\tfrac{1}{2}$$
$$\text{Downside break-even} = 40 - 9/1 = 31$$

It was stated earlier that *one might use an adjusted ratio in order to space the break-even points evenly around the current stock price.*

Example: Suppose XYZ is at 38 and the XYZ July 40 call is at 2. If one wanted to set up a reverse hedge that would profit if XYZ moved either up or down by the same distance, he could not use the 2:1 ratio. The 2:1 ratio would have break-even points of 34 and 46. Thus, the stock would start out much closer to the downside break-even point – only 4 points away – than to the upside break-even point, which is 8 points away. By altering the ratio, the investor can set up a reverse hedge that is more neutral on the underlying stock. Suppose that the investor shorted 100 shares of XYZ at 38 and bought *three* July 40 calls at 2 each. Then his break-even points would be 32 on the downside and 44 on the upside. This is a more neutral situation, with the downside break-even point being 6 points below the current stock price and the upside break-even point being 6 points away. The formulae above can be used to verify that, in fact, the break-evens are 32 and 44. Note that the 3:1 ratio has a maximum risk of 8 points, while the 2:1 ratio only had 6 points maximum risk.

A final adjustment that can be applied to this strategy is to short the stock and buy two calls, but with the calls having *different striking prices.* If XYZ were at 37½ to start with, one would have to use a ratio other than 2:1 to set up a position with break-even points spaced equidistant from the current stock price. When these higher ratios are used, the maximum risk is increased and the investor has to adopt a bullish or bearish stance. One may be able to create a position with equidistant break-even points and a smaller maximum risk by utilizing two different striking prices.

Example: The following prices exist:

XYZ, 37½;
XYZ July 40 call, 2; and
XYZ July 35 call, 4.

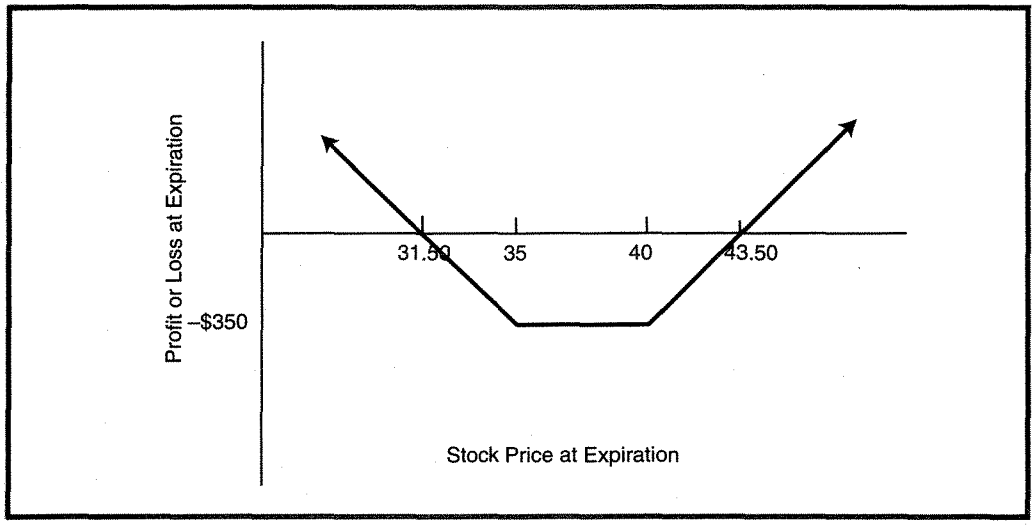
If one were to short 100 XYZ at 37½ and to buy one July 40 call for 2 and one July 35 call for 4, he would have a position that is similar to a reverse hedge except that *the maximum risk would be realized anywhere between 35 and 40 at expiration.* Although this risk is over a much wider range than in the normal reverse hedge, it is now much smaller in dimension. Table 4-3 and Figure 4-3 show the results from this type of position at expiration. The maximum loss is 3½ points ($350), which is a smaller amount than could be realized using any ratio strictly with the July 35 or the July 40 call. However, this maximum loss is realizable over the entire range, 35 to 40. Again, large potential profits are available if the stock moves far enough either to the upside or to the downside.

This form of the strategy should only be used when the stock is nearly centered between two strikes and the strategist wants a neutral positioning of the break-even points. Similar types of follow-up action to those described earlier can be applied to this form of the reverse hedge strategy as well.

TABLE 4-3.
Reverse hedge using two strikes.

XYZ Price at Expiration	Stock Profit	July 40 Call Profit	July 35 Call Profit	Total Profit
25	+$1,250	−$200	−$ 400	+$ 650
30	+ 750	− 200	− 400	+ 150
31½	+ 600	− 200	− 400	0
35	+ 250	− 200	− 400	− 350
37½	0	− 200	− 150	− 350
40	− 250	− 200	+ 100	− 350
43½	− 600	+ 150	+ 450	0
45	− 750	+ 300	+ 600	+ 150
50	− 1,250	+ 800	+ 1,100	+ 650

FIGURE 4-3.
Reverse hedge using two strikes (simulated combination purchase).



SUMMARY

The strategies described in this chapter would not normally be used if the underlying stock has listed put options. However, if no puts exist, or the puts are very illiquid, and the strategist feels that a volatile stock could move a relatively large distance in either direction during the life of a call option, he should consider using one of the forms of the reverse hedge strategy – shorting a quantity of stock and buying calls on more shares than he is short. If the desired movement does develop, potentially large profits could result. In any case, the loss is limited to a fixed amount, generally around 20 to 30% of the initial investment. Although it is possible to take follow-up action to lock in small profits and attempt to gain on a reversal by the stock, it is wiser to let the position run its course to capitalize on those occasions when the profits become large. Normally a 2:1 ratio (long 2 calls, short 100 shares of stock) is used in this strategy, but this ratio can be adjusted if the investor wants to be more bullish or more bearish. If the stock is initially between two striking prices, a neutral profit range can be set up by shorting the stock and buying calls at both the next higher strike and the next lower strike.

CHAPTER 5

Naked Call Writing

The next two chapters will concentrate on various aspects of writing uncovered call options. These strategies have risk of loss if the underlying stock should rise in price, but they offer profits if the underlying stock declines in price. This chapter – on naked, or uncovered, call writing – demonstrates some of the risks and rewards inherent in this aggressive strategy. Novice option traders often think that selling naked options is the "best" way to make money, because of time decay. In addition, they often assume that market-makers and other professionals sell a lot of naked options. In reality, neither is true. Yes, options do eventually lose their premium if held all the way until expiration. However, when an option has a good deal of life remaining, its excess value above intrinsic value – what we call "time value premium" – is, in reality, heavily influenced by the volatility estimate of the stock. This is called implied volatility and is discussed at length later in the book. For now, though, it is sufficient to understand that a lot can go wrong when one writes a naked option, before it eventually expires. As to professionals selling a lot of naked options, the fact is that most market-makers and other full-time option traders attempt to reduce their exposure to large stock price movements if possible. Hence, they may sell *some* options naked, but they generally try to hedge them by buying other options or by buying the underlying stock.

Many novice option traders hold these misconceptions, probably because there is a general belief that most options expire worthless. Occasionally, one will even hear or see a statement to this effect in the mainstream media, but it is not true that most options expire worthless. In fact, studies conducted by McMillan Analysis Corp. in both bull and bear months indicate that about 65% to 70% of all options have some value (at least half a point) when they expire. This is not to say that all option buyers make money, either, but it does serve to show that many more options do *not* expire worthless than do.

THE UNCOVERED (NAKED) CALL OPTION

When one sells a call option without owning the underlying stock or any equivalent security (convertible stock or bond or another call option), he is considered to have written *an uncovered call option.* This strategy has limited profit potential and theoretically unlimited loss. For this reason, this strategy is unsuitable for some investors. This fact is not particularly attractive, but since there is no actual cash investment required to write a naked call (the position can be financed with collateral loan value of marginable securities), the strategy can be operated as an adjunct to many other investment strategies.

A simple example will outline the basic profit and loss potential from naked writing.

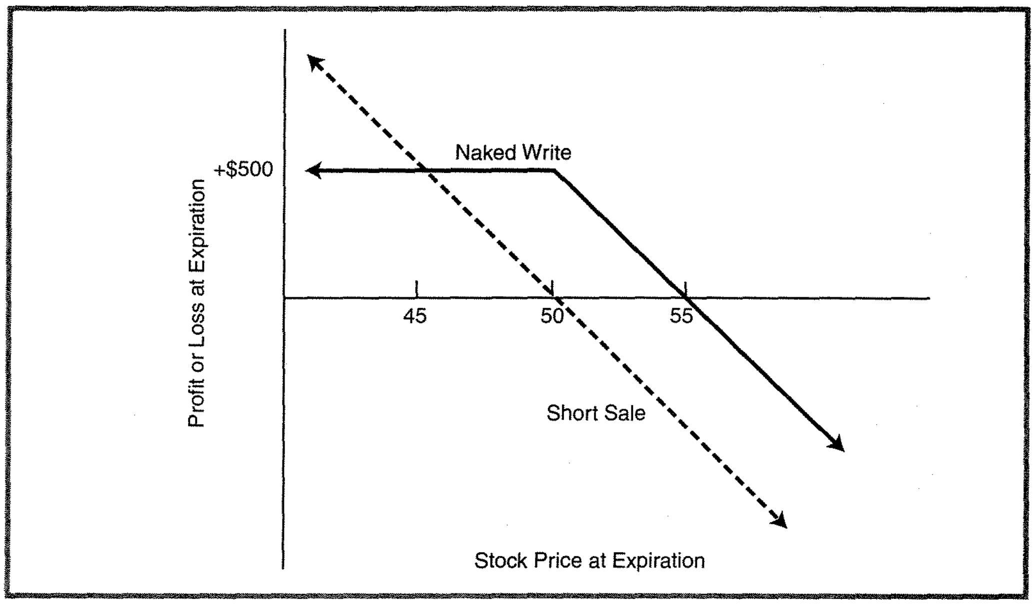
Example: XYZ is selling at 50 and a July 50 call is selling for 5. If one were to sell the July 50 call naked – that is, without owning XYZ stock, or any security convertible into XYZ, or another call option on XYZ – he could make, at most, 5 points of profit. This profit would accrue if XYZ were at or anywhere below 50 at July expiration, as the call would then expire worthless. If XYZ were to rise, however, the naked writer could potentially lose large sums of money. Should the stock climb to 100, say, the call would be at a price of 50. If the writer then covered (bought back) the call for a price of 50, he would have a loss of 45 points on the transaction. In theory, this loss is unlimited, although *in practice the loss is limited by time.* The stock cannot rise an infinite amount during the life of the call. Clearly, defensive strategies are important in this approach, as one would never want to let a loss run as far as the one here. Table 5-1 and Figure 5-1 (solid line) depict the results of this position at July expiration. Note that the break-even point in this example is 55. That is, if XYZ rose 10%, or 5 points, at expiration, the naked writer would break even. He could buy the call back at parity, 5 points, which is exactly what he sold it for. There is some room for error to the upside. *A naked write will not necessarily lose money if the stock moves up.* It will only lose if the stock advances by more than the amount of the time value premium that was in the call when it was originally written.

Naked writing is not the same as a short sale of the underlying stock. While both strategies have large potential risk, the short sale has much higher reward potential, but the naked write will do better if the underlying stock remains relatively unchanged. It is possible for the naked writer to make money in situations when the short seller would have lost money. Using the example above, suppose one investor had written the July 50 call naked for 5 points while another investor sold the stock short at 50. If XYZ were at 52 at expiration, the naked writer could buy the call back at parity, 2 points, for a 3-point profit. The short seller would have a 2-point *loss.*

TABLE 5-1.
Position at July expiration.

XYZ Price at Expiration	Call Price at Expiration	Profit on Naked Write
30	0	+$ 500
40	0	+ 500
50	0	+ 500
55	5	0
60	10	− 500
70	20	− 1,500
80	30	− 2,500

FIGURE 5-1.
Uncovered (naked) call write.



Moreover, the short seller pays out the dividends on the underlying stock, whereas the naked call writer does not. The naked call will expire, of course, but the short sale does not. This is a situation in which the naked write outperforms the short sale. However, if XYZ were to fall sharply – to 20, say – the naked writer could only make 5 points while the short seller would make 30 points. The dashed line in Figure 5-1 shows how the short sale of XYZ at 50 would compare with the naked write of the July 50 call. Notice that the two strategies are equal at 45 at expiration; they both

make a 5-point profit there. Above 45, the naked write does better; it has larger profits and smaller losses. Below 45, the short sale does better, and the farther the stock falls, the better the short sale becomes in comparison. As will be seen later, one can more closely simulate a short sale by writing an in-the-money naked call.

INVESTMENT REQUIRED

The *margin requirements* for writing a naked call are 20% of the stock price plus the call premium, less the amount by which the stock is below the striking price. If the stock is below the striking price, the differential is subtracted from the requirement. However, a minimum of 10% of the stock price is required for each call, even if the computation results in a smaller number. Table 5-2 gives four examples of how the initial margin requirement would be computed for four different stock prices. The 20% collateral figure is the minimum exchange requirement and may vary somewhat among different brokerage houses. *The call premium may be applied against the requirement.* In the first line of Table 5-2, if the XYZ July 50 call were selling for 7 points, the $700 call premium could be applied against the $1,800 margin requirement, reducing the actual amount that the investor would have to put up as collateral to $1,100.

TABLE 5-2.
Initial collateral requirements for four stock prices.

Call Written	Stock Price When Call Written	Call Price	20% of Stock Price	Out-of-the-Money Differential	Total Margin Requirement
XYZ July 50	55	$700	$1,100	$ 0	$1,800
XYZ July 50	50	400	1,000	0	1,400
XYZ July 50	46	200	920	– 400	720
XYZ July 50	40	100	800	– 1,000	400*

*Requirement cannot be less than 10%.

In addition to the basic requirements, a brokerage firm may require that for a customer to participate in uncovered writing, he have a minimum equity in his account. This equity requirement may range from as low as $2,000 to as high as $100,000. Since naked call writing is a high-risk strategy, some brokerage firms require that the customer be able to show both financial wherewithal and option

trading experience before the account can be approved for naked call writing. In addition, some brokers require that a maintenance requirement be applied against each option written naked. This requirement, sometimes called a *kicker,* is usually less than $250 per call and is generally used by the broker to ensure that, should the customer fail to respond to an assignment notice against his naked call, the commission costs for buying and selling the underlying stock would be defrayed.

Naked Option Positions Are Marked to the Market Daily. This means that the collateral requirement for the position is recomputed daily, just as in the short sale of stock. The same margin formula that was described above is applied and, if the stock has risen far enough, the customer will be required to deposit additional collateral or close the position. The need for such a mark to market is obvious. If the underlying stock should rise, the brokerage firm must ensure that the customer has enough collateral to cover the eventuality of buying the stock in the open market and selling it at the striking price if an assignment notice should be received against the naked call. The mark to market works to the customer's favor if the stock falls in price. Excess collateral is then released back into the customer's margin account, and may be used for other purposes.

It is important to realize that, *in order to write a naked call, collateral is all that is required.* No cash need be "invested" if one owns securities with sufficient collateral loan value.

Example: An investor owns 100 shares of a stock selling at $60 per share. This stock is worth $6,000. If the loan rate on stock is 50% of $6,000, this investor has a collateral loan value equal to 50% of $6,000, or $3,000. This investor could write any of the naked calls in Table 5-2 without adding cash or securities to his account. Moreover, he would have satisfied a minimum equity requirement of at least $6,000, since his stock is equity.

This aspect of naked call writing – using collateral value to finance the writing – is attractive to many investors, since one is able to write calls and bring in premiums without disturbing his existing portfolio. Of course, if the stock underlying the naked call should rise too far in price, additional collateral may be called for by the broker because of the mark to market. Moreover, there is risk whether cash or collateral is used. If one buys in a naked call at a loss, he will then be spending cash, creating a debit in his account.

Regardless of how one finances a naked option position, it is generally a good idea to allow enough collateral so that the stock can move all the way to the point at which one would cover the option or take follow-up action. For example, suppose a

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Regardless of how one finances a naked option position, it is generally a good idea to allow enough collateral so that the stock can move all the way to the point at which one would cover the option or take follow-up action. For example, suppose a

stock is trading at 50 and one sells an April 60 call naked, figuring that he will cover the call if the stock rises to 60 (that is, if the option becomes an in-the-money option). He should set aside enough collateral to margin the position as if the stock were at 60 (even though the *actual* margin requirement will be smaller than that). If he allows that extra collateral, then he will never be forced into a margin call at a stock price prior to (that is, below) where he wanted to take follow-up action. Simply stated, let the market take you out of a position, not a margin call.

THE PHILOSOPHY OF SELLING NAKED OPTIONS

The first and foremost question one must address when thinking about selling naked options (or any strategy, for that matter) is: "Can I psychologically handle the thought of naked options in my account?" Notice that the question does not have anything to do with whether one has enough collateral or margin to sell calls (although that, too, is important) nor does it ask how much money he will make. First, one must decide if he can be comfortable with the risk of the strategy. Selling naked options means that there is theoretically unlimited risk if the underlying instrument should make a large, sudden, adverse move. It is one's attitude regarding that fact alone that determines whether he should consider selling naked options. If one feels that he won't be able to sleep at night, then *he should not sell naked options,* regardless of any profit projections that might seem attractive.

If one feels that the psychological suitability aspect is not a roadblock, then he can consider whether he has the financial wherewithal to write naked options. On the surface, naked option margin requirements are not large (although in equity and index options, they are larger than they were prior to the crash of 1987).

In general, one would prefer to let the naked options expire worthless, if at all possible, without disturbing them, unless the underlying instrument makes a *significant* adverse move. So, out-of-the-money options are the usual choice for naked selling. Then, in order to reduce (or almost eliminate) the chance of a margin call, *one should set aside the margin requirement as if the underlying had already moved to the strike price of the option sold.* By allowing margin as if the underlying were already at the strike, one will almost never experience a margin call before the underlying price trades up to the strike price, at which time it is best to close the position or to roll the call to another strike.

Thus, for naked equity call options, allow as collateral 20% of the highest naked strike price. In this author's opinion, the biggest mistake a trader can make is to initiate trades because of margin or taxes. Thus, by allowing the "maximum" margin, one can make trading decisions based on what's happening in the market, as opposed to reacting to a margin call from his broker.

"Suitability" also means not risking more money than one can afford to lose. If one allows the "maximum" margin, then he won't be risking a large portion of his equity unless he is unable to cover when the underlying trades through the strike price of his naked option. Gaps in trading prices would be the culprits that could prevent one from covering. Gaps are common in stocks, less common in futures, and almost nonexistent in indices. *Hence, index options are the options of choice when it comes to naked writing.* Index options are discussed later in the book.

Finally, there is one more "rule" that a naked option writer must follow: *Someone has to be watching the position at all times.* Disasters could occur if one were to go on vacation and not pay attention to his naked options. Usually, one's broker can watch the position, even if the trader has to call him from his vacation site.

In sum, then, to write naked options, one needs to be prepared psychologically, have sufficient funds, be willing to accept the risk, be able to monitor the position every day, sell options whose implied volatility is extremely high, and cover any naked options that become in-the-money options.

RISK AND REWARD

One can adjust the apparent risks and rewards from naked call writing by his selection of an in-the-money or out-of-the-money call. Writing an out-of-the-money call naked, especially one quite deeply out-of-the-money, offers a high probability of achieving a small profit. Writing an in-the-money call naked has the most profit potential, but it also has higher risks.

Example: XYZ is selling at 40 and the July 50 is selling for ½. This call could be sold naked. The probability that XYZ could rise to 50 by expiration has to be considered small, especially if there is not a large amount of time remaining in the life of the call. In fact, the stock could rise 25%, or 10 points, by expiration to a price of 50, and the call would still expire worthless. Thus, this naked writer has a good chance of realizing a $50 profit, less commissions. There could, of course, be substantial risk in terms of potential profit versus potential loss if the stock rises substantially in price by expiration. Still, this apparent possibility of achieving additional limited income with a high probability of success has led many investors to use the collateral value of their portfolios to sell deeply out-of-the-money naked calls.

For those employing this technique, a favored position is to have a stock at or just about 15 and then sell the near-term option with striking price 20 naked. This option would sell for one-eighth or one-quarter, perhaps, although at times there might not be any bid at all. At this price, the stock would have to rally nearly one-

third, or 33%, for the writer to lose money. Although there are not usually many optionable stocks selling at or just above $10 per share, these same out-of-the-money writers would also be attracted to selling a call with a striking price 15 when the stock is at 10, because a 50% upward move by the stock would be required for a loss to be realized.

This strategy of selling deeply out-of-the-money calls has its apparent attraction in that the writer is assured of a profit unless the underlying stock can rally rather substantially before the call expires. The danger in this strategy is that one or two losses, perhaps amounting to only a couple of points each, could wipe out many periods of profits. The stock market does occasionally rally heavily in a short period, as witnessed repeatedly throughout history. Thus, the writer who is adopting this strategy cannot regard it as a sure thing and certainly cannot afford to establish the writes and forget them. Close monitoring is required in case the market begins to rally, and by no means should losses be allowed to accumulate.

The opposite end of the spectrum in naked call writing is the writing of fairly deeply in-the-money calls. Since an in-the-money call would not have much time value premium in it, this writer does not have much leeway to the upside. If the stock rallies at all, the writer of the deeply in-the-money naked call will normally experience a loss. However, should the stock drop in price, this writer will make larger dollar profits than will the writer of the out-of-the-money call. The sale of the deeply in-the-money call simulates the profits that a short seller could make, at least until the stock drops close to the striking price, since the delta of a deeply in-the-money call is close to 1.

Example: XYZ is selling at 60 and the July 50 call is selling for 10½. If XYZ rises, the naked writer will lose money, because there is only ½ of a point of time value premium in the call. If XYZ falls, the writer will make profits on a point-for-point basis until the stock falls much closer to 50. That is, if XYZ dropped from 60 to 57, the call price would fall by almost 3 points as well. Thus, for quick declines by the stock, the deeply in-the-money write can provide profits nearly equal to those that the short seller could accumulate. Notice that if XYZ falls all the way to 50, the profits on the written call will be large, but will be accumulating at a slower rate as the time value premium builds up with the stock near the striking price.

If one is looking to trade a stock on the short side for just a few points of movement, he might use a deeply in-the-money naked write instead of shorting the stock. His investment will be smaller – 20% of the stock price for the write as compared to 50% of the stock price for the short sale – and his return will thus be larger. (The requirement for the in-the-money amount is offset by applying the call's premium.)

The writer should take great caution in ascertaining that the call does have some time premium in it. He does not want to receive an assignment notice on the written call. It is easiest to find time premium in the more distant expiration series, so the writer would normally be safest from assignment by writing the longest-term deep in-the-money call if he wants to make a bearish trade in the stock.

Example: An investor thinks that XYZ could fall 3 or 4 points from its current price of 60 in a quick downward move, and wants to capitalize on that move by writing a naked call. If the April 40 were the near-term call, he might have the choice of selling the April 40 at 20, the July 40 at 20¼, or the October 40 at 20½. Since all three calls will drop nearly point for point with the stock in a move to 56 or 57, he should write the October 40, as it has the least risk of being assigned. A trader utilizing this strategy should limit his losses in much the same way a short seller would, by covering if the stock rallies, perhaps breaking through overhead technical resistance.

ROLLING FOR CREDITS

Most writers of naked calls prefer to use one of the two strategies described above. The strategy of writing *at-the-money* calls, when the stock price is initially close to the striking price of the written call, is not widely utilized. This is because the writer who wants to limit risk will write an out-of-the-money call, whereas the writer who wants to make larger, quick trading profits will write an in-the-money call. There is, however, a strategy that is designed to utilize the at-the-money call. This strategy offers a high degree of eventual success, although there may be an accumulation of losses before the success point is reached. It is a strategy that requires large collateral backing, and is therefore only for the largest investors. We call this strategy "rolling for credits." The strategy is described here in full, although it can, at times, resemble a Martingale strategy; that is, one that requires "doubling up" to succeed, and one that can produce ruin if certain physical limits are reached. The classic Martingale strategy is this: Begin by betting one unit; if you lose, double your bet; if you win that bet, you'll have netted a profit of one unit (you lost one, but won two); if you lost the second bet, double your bet again. No matter how many times you lose, keep doubling your bet each time. When you eventually win, you will profit by the amount of your original bet (one unit). Unfortunately, such a strategy cannot be employed in real life. For example, in a gambling casino, after enough losses, one would bump up against the table limit and would no longer be able to double his bet. Consequently, the strategy would be ruined just when it was at its worst point. While "rolling for credits" doesn't exactly call for one to double the number of written calls each time, it *does* require that one keep increasing his risk exposure in order to profit by the amount of that original credit sold. In general, Martingale strategies should be avoided.

In essence, *the writer who is rolling for credits sells the most time premium that he can at any point in time.* This would generally be the longest-term, at-the-money call. If the stock declines, the writer makes the time premium that he sold. However, if the stock rises in price, the writer rolls up for a *credit.* That is, when the stock reaches the next higher striking price, the writer buys back the calls that were originally sold and sells enough long-term calls at the higher strike to generate a credit. In this way, no debits are incurred, although a realized loss is taken on the rolling up. If the stock persists and rises to the next striking price, the process is repeated. Eventually, the stock will stop rising – they always do – and the last set of written options will expire worthless. At that time, the writer would make an overall profit consisting of an amount equal to all the credits that he had taken in so far. In reality, most of that credit will simply be the initial credit received. The "rolls" are done for even money or a small credit. In essence, the increased risk generated by continually rolling up is all geared toward eventually capturing that initial credit. The similarity to the Martingale strategy is strongest in this regard: One continually increases his risk, knowing that when he eventually wins (i.e., the last set of options expires worthless), he profits by the amount of his original "bet."

There are really only two requirements for success in this strategy. The first is that the underlying stock eventually fall back, that it does not rise indefinitely. This is hardly a requirement; it is axiomatic that all stocks will eventually undergo a correction, so this is a simple requirement to satisfy. The second requirement is that the investor have enough collateral backing to stay with the strategy even if the stock runs up heavily against him.

This is a much harder requirement to satisfy, and may in fact turn out to be nearly *impossible* to satisfy. If the stock were to experience a straight-line upward move, the number of calls written might grow so substantially that they would require an unrealistically large amount of collateral (margin). At a minimum, this strategy is applicable only for the largest investors. For such well-collateralized investors, this strategy can be thought of as a way to add income to a portfolio. That is, a large stock portfolio's equity may be used to finance this strategy through its loan value. There would be no margin interest charges, because all transactions are credit transactions. (No debits are created, as long as the Martingale "limits" are not reached.) The securities portfolio would not have to be touched unless the strategy were terminated before the last set of calls expired worthless.

This is where the danger comes in: If the stock upon which the calls are written rises so fast that one completely uses up all of his collateral value to finance the naked calls, and *then* one is required to roll again, the strategy could result in large losses. For a while, one could simply continue to roll the same number of calls up for debits, but eventually those debits would mount in size if the stock persisted in rising. At

this point, even if the stock did finally decline enough for the last set of calls to expire worthless, the overall strategy might still have been operated at a loss.

Example: The basic strategy in the case of rising stock is shown in Table 5-3. Note that each transaction is a credit and that all (except the last) involve taking a realized loss.

This example assumes that the stock rose so quickly that a longer-term call was never available to roll into. That is, the October calls were always utilized. If there were a longer-term call available (the January series, for example), the writer should roll up and out as well. In this way, larger credits could be generated. The number of calls written increased from 5 to 15 and the collateral required as backing for the writing of the naked calls also increased heavily. Recall that the collateral requirement is equal to 20% of the stock price plus the call premium, less the amount by which the call is out-of-the-money. The premium may be used against the collateral requirements. Using the stock and call prices of the example above, the investment is computed in Table 5-4. While the number of written calls has tripled from 5 to 15, the collateral requirement has more than quadrupled from $5,000 to $21,000. This is why the investor must have ample collateral backing to utilize this strategy. The general philosophy of the large investors who do apply this strategy is that they hope to eventually make a profit and, since they are using the collateral value of large security positions already held, they are not investing any more money. The strategy does not really "cost" these investors anything. *All profits represent additional income and do not in any way disturb the underlying security portfolio.* Unfortunately, losses taken due to aborting the strategy could seriously affect the portfolio. This is why the investor must have sufficient collateral to carry through to completion.

The sophisticated strategist who implements this strategy will generally do more rolling than that discussed in the simple example above. First, if the stock drops, the calls will be rolled down to the next strike – for a credit – in order to constantly be selling the most time premium, which is always found in the longest-term at-the-money call. Furthermore, the strategist may want to roll out to a more distant expiration series whenever the opportunity presents itself. This rolling out, or forward, action is only taken when the stock is relatively unchanged from the initial price and there is no need to roll up or down.

This strategy seems very attractive as long as one has enough collateral backing. Should one use up all of his available collateral, the strategy could collapse, causing substantial losses. It may not necessarily generate large rates of return in rising markets, but in stable or declining markets the generation of additional income can be quite substantial. Since the investor is not putting up any additional cash but is uti-

TABLE 5-3.
Rolling for credits when stock is rising.

Initially: XYZ = 50	
Sell 5 XYZ October 50's at 7	+$3,500 credit
Later: XYZ rises to 60	
Buy 5 XYZ October 50's at 11 and	− 5,500 debit
sell 8 XYZ October 60's at 7	+ 5,600 credit
Later: XYZ rises further to 70	
Buy 8 XYZ October 60's at 11 and	− 8,800 debit
sell 15 XYZ October 70's at 6	+ 9,000 credit
Finally: XYZ falls and the October 70's expire worthless	
	Net gain = +$3,800

TABLE 5-4.
Increase in collateral requirement.

Initially: XYZ = 50	
Sell 5 XYZ October 50's at 7	$ 5,000 collateral required
($3,500 net credit)	
Later: XYZ = 60	
Sell 8 XYZ October 60's at 7	
Buy 5 October 50's at 11	
($3,600 net credit to date)	$ 9,600 collateral required
Later: XYZ = 70	
Sell 15 XYZ October 70's at 6	
Buy 8 XYZ October 60's at 11	
($3,800 net credit to date)	$21,000 collateral required

lizing the collateral power of his present securities, his "investment" is actually zero. Any profits represent additional income. The investor must be aware of one other factor that can upset the strategy. If a stock should rise so far as to require the number of calls to exceed the position limits set by the OCC, the strategy is ruined. In the example above, XYZ would probably have to rise to about a price of over 200, without a correction, before the sale of **1,000* calls would be required. If the strategist originally started with too many naked calls, he could potentially exceed the limit in a short time period. Rather than attempting to sell too many calls initially in any one

*Position limits are higher now.

security, the strategist should diversify several moderately sized positions throughout a variety of underlying stocks. If he does this, he will probably never have to exceed the position limit of contracts short in any one security.

Even with as many precautions as one might take, there is no guarantee that one would have the collateral available to withstand a gain of 1000% or more, such as is occasionally seen with high-flying tech stocks or new IPOs. One would probably be best served, if he really wants to operate this strategy, to stick with stocks that are well capitalized (some of the biggest in the industry), so that they are less susceptible to such violent upside moves. Even then, though, there is no guarantee that one will not run out of collateral in a sharply rising market, because it is impossible to estimate with complete certainty just how far any one stock might advance in a particular period of time.

TIME VALUE PREMIUM IS A MISNOMER

Once again, the topic of time value premium is discussed, as it was in Chapter 3. Many novice option traders think that if they sell an out-of-the-money option (whether covered or naked), all they have to do is sit back and wait to collect the premium as time wears it away. However, a lot of things can happen between the time an option is sold and its expiration date. The stock can move a great deal, or implied volatility can skyrocket. Both are bad for the option seller and both completely counteract any benefit that time decay might be imparting. The option seller must consider what might happen *during* the life of the option, and not simply view it as a strategy to hold the option until expiration. Naked call writers, especially, should operate with that thought in mind, but so should covered call writers, even though most don't. What the covered writer gives away is the upside; and if he constantly sells options without regard to the possibilities of volatility or stock price increases, he will be doing himself a disservice.

So, while it is still proper to refer to the part of an option's price that is *not* intrinsic value as "time value premium," the knowledgeable option trader understands that it is also more heavily influenced by volatility and stock price movement than by time.

SUMMARY

In a majority of cases, naked call writing is applied as a deeply out-of-the-money strategy in which the investor uses the collateral value of his security holdings to participate in a strategy that offers a large probability of making a very limited profit. It is a poor strategy, because one loss may wipe out many profits. The trader who

desires an alternative to a short sale may use the sale of an in-the-money naked call in order to attempt to make a quick profit on a smaller investment than the short seller would have to make. Both of these strategies could entail large risk if one does not have sufficient capital backing.

An alternative strategy, but one that is available only to very large investors, is to sell at-the-money calls naked, rolling up and forward for credits if the underlying stock rises in price. This strategy, however, can become disastrous if it takes on Martingale-like qualities during a rocketing rise by the underlying stock.

CHAPTER 6

Ratio Call Writing

Two basic types of call writing have been described in previous chapters: covered call writing, in which one owns the underlying stock and sells a call; and naked call writing. Ratio writing is a combination of these two types of positions.

THE RATIO WRITE

Simply stated, *ratio call writing* is the strategy in which one owns a certain number of shares of the underlying stock and sells calls against more shares than he owns. Thus, there is a ratio of calls written to stock owned. The most common ratio is the 2:1 ratio, whereby one owns 100 shares of the underlying stock and sells 2 calls. Note that this type of position involves writing a number of naked call options as well as a number of covered options. This resulting position has both downside risk, as does a covered write, and unlimited upside risk, as does a naked write. The ratio write generally will provide much larger profits than either covered writing or naked writing if the underlying stock remains relatively unchanged during the life of the calls. However, the ratio write has two-sided risk, a quality absent from either covered or naked writing.

Generally, when an investor establishes a ratio write, he attempts to be neutral in outlook regarding the underlying stock. This means that he writes the calls with striking prices closest to the current stock price.

Example: A ratio write is established by buying 100 shares of XYZ at 49 and selling two XYZ October 50 calls at 6 points each. If XYZ should decline in price and be anywhere below 50 at October expiration, the calls will expire worthless and the writer will make 12 points from the sale of the calls. Thus, even if XYZ drops 12 points to a price of 37, the ratio writer will break even. The stock loss of 12 points

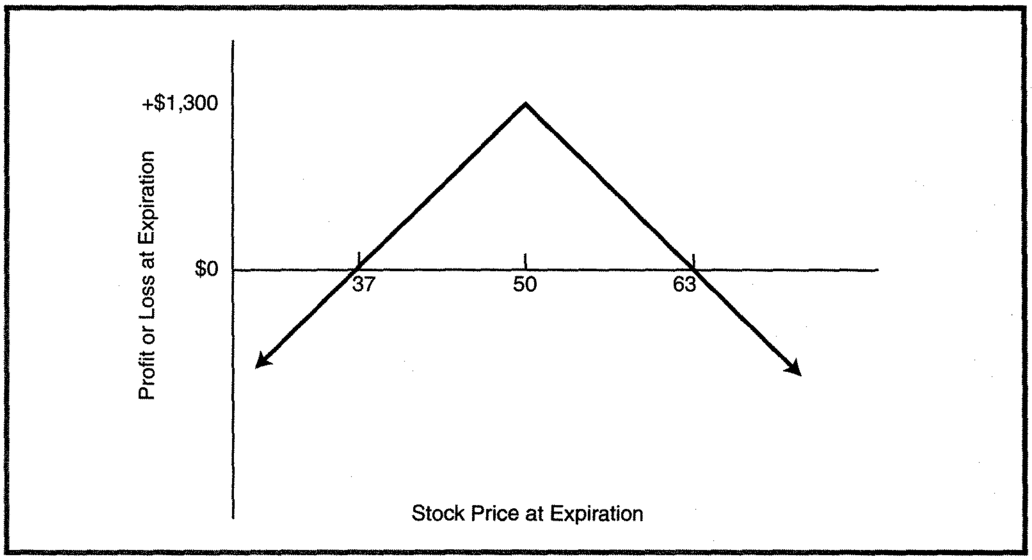
would be offset by a 12-point gain on the calls. As with any strategy in which calls are sold, the maximum profit occurs at the striking price of the written calls at expiration. In this example, if XYZ were at 50 at expiration, the calls would still expire worthless for a 12-point gain and the writer would have a 1-point profit on his stock, which has moved up from 49 to 50, for a total gain of 13 points. This position therefore has ample downside protection and a relatively large potential profit. Should XYZ rise above 50 by expiration, the profit will decrease and eventually become a loss if the stock rises too far. To see this, suppose XYZ is at 63 at October expiration. The calls will be at 13 points each, representing a 7-point loss on each call, because they were originally sold for 6 points apiece. However, there would be a 14-point gain on the stock, which has risen from 49 to 63. The overall net is a break-even situation at 63 – a 14-point gain on the stock offset by 14 points of loss on the options (7 points each). Table 6-1 and Figure 6-1 summarize the profit and loss potential of this example at October expiration. The shape of the graph resembles a roof with its peak located at the striking price of the written calls, or 50. It is obvious that the position has both large upside risk above 63 and large downside risk below 37. Therefore, it is imperative that the ratio writer plan to take follow-up action if the stock should move outside these prices. Follow-up action is discussed later. If the stock remains within the range 37 to 63, some profit will result before commission charges. This range between the downside break-even point and the upside break-even point is called the *profit range*.

This example represents essentially a neutral position, because the ratio writer will make some profit unless the stock falls by more than 12 points or rises by more than 14 points before the expiration of the calls in October. This is frequently an attractive type of strategy to adopt because, normally, stocks do not move very far in

TABLE 6-1.
Profit and loss at October expiration.

XYZ Price at Expiration	Stock Profit	Call Price	Profit on Calls	Total Profit
30	–$1,900	0	+$1,200	–$ 700
37	– 1,200	0	+ 1,200	0
45	– 400	0	+ 1,200	+ 800
50	+ 100	0	+ 1,200	+1,300
55	+ 600	5	+ 200	+ 800
63	+ 1,400	13	– 1,400	0
70	+ 2,100	20	– 2,800	– 700

FIGURE 6-1.
Ratio write (2:1).



a 3- or 6-month time period. Consequently, this strategy has a rather high probability of making a limited profit. The profit in this example would, of course, be reduced by commission costs and margin interest charges if the stock is bought on margin.

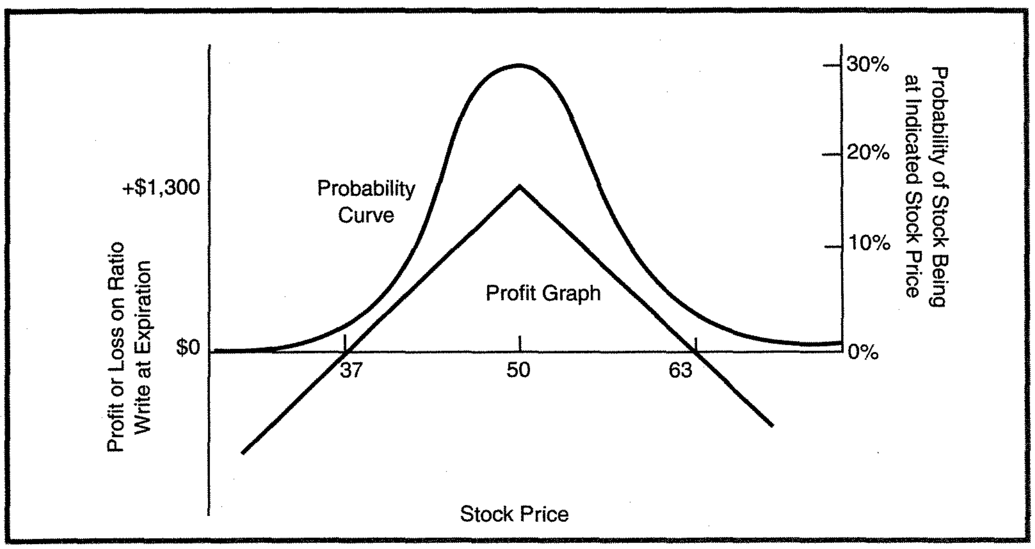
Before discussing the specifics of ratio writing, such as investment required, selection criteria, and follow-up action, it may be beneficial to counter two fairly common objections to this strategy. The first objection, although not heard as frequently today as when listed options first began trading, is "Why bother to buy 100 shares of stock and sell 2 calls? You will be naked one call. Why not just sell one naked call?" The ratio writing strategy and the naked writing strategy have very little in common except that both have upside risk. The profit graph for naked writing (Figure 5-1) bears no resemblance to the roof-shaped profit graph for a ratio write (Figure 6-1). Clearly, the two strategies are quite different in profit potential and in many other respects as well.

The second objection to ratio writing for the conservative investor is slightly more valid. The conservative investor may not feel comfortable with a position that has risk if the underlying stock moves up in price. This can be a psychological detriment to ratio writing: When stock prices are rising and everyone who owns stocks is happy and making profits, the ratio writer is in danger of losing money. However, in a purely strategic sense, one should be willing to assume some upside risk in exchange for larger profits if the underlying stock does not rise heavily in price. The

covered writer has upside protection all the way to infinity; that is, he has no upside risk at all. This cannot be the mathematically optimum situation, because stocks never rise to infinity. Rather, the ratio writer is engaged in a strategy that makes its profits in a price range more in line with the way stocks actually behave. In fact, if one were to try to set up the optimum strategy, he would want it to make its most profits in line with the most probable outcomes for a stock's movement. Ratio writing is such a strategy.

Figure 6-2 shows a simple probability curve for a stock's movement. It is most likely that a stock will remain relatively unchanged and there is very little chance that it will rise or fall a great distance. Now compare the results of the ratio writing strategy with the graph of probable stock outcomes. Notice that the ratio write and the probability curve have their "peaks" in the same area; that is, the ratio write makes its profits in the range of most likely stock prices, because there is only a small chance that any stock will increase or decrease by a large amount in a fixed period of time. The large losses are at the edges of the graph, where the probability curve gets very low, approaching zero probability. It should be noted that these graphs show the profit and probability *at expiration. Prior to* expiration, the break-even points are closer to the original purchase price of the stock because there will still be some time value premium remaining on the options that were sold.

FIGURE 6-2.
Stock price probability curve overlaid on profit graph of ratio write.



INVESTMENT REQUIRED

The ratio writer has a combination of covered writes and naked writes. The margin requirements for each of these strategies have been described previously, and the requirements for a ratio writing strategy are the sum of the requirements for a naked write and a covered write. Ratio writing is normally done in a margin account, although one could technically keep the stock in a cash account.

Example: Ignoring commissions, the investment required can be computed as follows: Buy 100 XYZ at 49 on 50% margin and sell 2 XYZ October 50 calls at 6 points each (Table 6-2). The commissions for buying the stock and selling the calls would be added to these requirements. A shorter formula (Table 6-3) is actually more desirable to use. It is merely a combination of the investment requirements listed in Table 6-2.

In addition to the basic requirement, there may be minimum equity requirements and maintenance requirements, since naked calls are involved. As these vary from one brokerage firm to another, it is best for the ratio writer to check with his broker to determine the equity and maintenance requirements. Again, since naked calls are involved in ratio writing, there will be a mark to market of the position. If the stock should rise in price, the investor will have to put up more collateral.

It is conceivable that the ratio writer would want to stay with his original position as long as the stock did not penetrate the upside break-even point of 63.

TABLE 6-2.
Investment required.

Covered writing portion (buy 100 XYZ and sell 1 call)	
50% of stock price	\$2,450
Less premium received	− 600
Requirement for covered portion	\$1,850
Naked writing portion (sell 1 XYZ call)	
20% of stock price	\$ 980
Less out-of-the-money amount	− 100
Plus call premium	+ 600
Less premium received	− 600
Requirement for naked portion	\$ 880
Total requirement for ratio write	\$2,730

TABLE 6-3.
Initial investment required for a ratio write.

70% of stock cost (XYZ = 49)	$3,430	
Plus naked call premiums	+ 600	
Less total premiums received	– 1,200	
Plus or minus striking price differential on naked calls	– 100	
Total requirement	$2,730	(plus commissions)

TABLE 6-4.
Collateral required with stock at upside break-even point of 63.

Covered writing requirement	$1,850	(see Table 6-2)
20% of stock price (XYZ = 63)	1,260	
Plus call premium	1,400	
Less initial call premium received	– 600	
Total requirement with XYZ at 63	$3,910	

Therefore, he should allow for enough collateral to cover the eventuality of a move to 63. Assuming the October 50 call is at 14 in this case, he would need $3,910 (see Table 6-4). This is the requirement that the ratio writer should be concerned with, not the initial collateral requirement, and he should therefore plan to invest $3,910 in this position, not $2,730 (the initial requirement). Obviously, he only has to put up $2,730, but from a strategic point of view, he should allow $3,910 for the position. If the ratio writer does this with all his positions, he would not receive a margin call even if all the stocks in his portfolio climbed to their upside break-even points.

SELECTION CRITERIA

To decide whether a ratio write is a desirable position, the writer must first determine the break-even points of the position. Once the break-even points are known, the writer can then decide if the position has a wide enough profit range to allow for defensive action if it should become necessary. One simple way to determine if the profit range is wide enough is to require that the next higher and lower striking prices be within the profit range.

Example: The writer is buying 100 XYZ at 49 and selling 2 October 50 calls at 6 points apiece. It was seen, by inspection, that the break-even points in the position are 37 on the downside and 63 on the upside. A mathematical formula allows one to quickly compute the break-even points for a 2:1 ratio write.

Points of maximum profit	= Strike price – Stock price + 2 × Call price
Downside break-even point	= Strike price – Points of maximum profit
	= Stock price – 2 × Call price
Upside break-even point	= Strike price + Points of maximum profit

In this example, the points of maximum profit are 50 – 49 + 2 × 6, or 13. Thus, the downside break-even point would be 37 (50 – 13) and the upside break-even point would be 63 (50 + 13). These numbers agree with the figures determined earlier by analyzing the position.

This profit range is quite clearly wide enough to allow for defensive action should the underlying stock rise to the next highest strikes of 55 or 60, or fall to the next two lower strikes, at 45 and 40. In practice, a ratio write is not automatically a good position merely because the profit range extends far enough. Theoretically, one would want the profit range to be wide in relation to the volatility of the underlying stock. If the range is wide in relation to the volatility and the break-even points encompass the next higher and lower striking prices, a desirable position is available. Volatile stocks are the best candidates for ratio writing, since their premiums will more easily satisfy both these conditions. A nonvolatile stock may, at times, have relatively large premiums in its calls, but the resulting profit range may still not be wide enough numerically to ensure that follow-up action could be taken. Specific measures for determining volatility may be obtained from many data services and brokerage firms. Moreover, methods of computing volatility are presented later in the chapter on mathematical applications, and probabilities are further addressed in the chapters on volatility trading.

Technical support and resistance levels are also important in establishing the position. If both support and resistance lie within the profit range, there is a better chance that the stock will remain within the range. A position should not necessarily be rejected if there is not support and resistance within the profit range, but the writer is then subjecting himself to a possible undeterred move by the stock in one direction or the other.

The ratio writer is generally a neutral strategist. He tries to take in the most time premium that he can to earn the premium erosion while the stock remains relatively unchanged. If one is more bullish on a particular stock, he can set up a 2:1 ratio write with out-of-the-money calls. This allows more room to the upside than to the downside, and therefore makes the position slightly more bullish. Conversely, if

one is more bearish on the underlying stock, he can write in-the-money calls in a 2:1 ratio.

There is another way to produce a slightly more bullish or bearish ratio write. This is to *change the ratio of calls written* to stock purchased. This method is also used to construct a neutral profit range when the stock is not close to a striking price.

Example: An investor is slightly bearishly inclined in his outlook for the underlying stock, so he might write more than two calls for each 100 shares of stock purchased. His position might be to buy 100 XYZ at 49 and sell 3 XYZ October 50 calls at 6 points each. This position breaks even at 31 on the downside, because if the stock dropped by 18 points at expiration, the call profits would amount to 18 points and would produce a break-even situation. To the upside, the break-even point lies at $59\frac{1}{2}$ for the stock at expiration. Each call would be worth $9\frac{1}{2}$ at expiration with the stock at $59\frac{1}{2}$, and each call would thus lose $3\frac{1}{2}$ points, for a total loss of $10\frac{1}{2}$ points on the three calls. However, XYZ would have risen from 49 to $59\frac{1}{2}$ – a $10\frac{1}{2}$-point gain – therefore producing a break-even situation. Again, a formula is available to aid in determining the break-even point for any ratio.

$$\text{Maximum profit} = (\text{Striking price} - \text{Stock price}) \times \text{Round lots purchased} + \text{Number of calls written} \times \text{Call price}$$

$$\text{Downside break-even} = \frac{\text{Striking}}{\text{price}} - \frac{\text{Maximum profit}}{\text{Number of round lots purchased}}$$

$$\text{Upside break-even} = \frac{\text{Striking}}{\text{price}} + \frac{\text{Maximum profit}}{(\text{Calls written} - \text{Round lots purchased})}$$

Note that in the case of a 2:1 ratio write, where the number of round lots purchased equals 1 and the number of calls written equals 2, these formulae reduce to the ones given earlier for the more common 2:1 ratio write. To verify that the formulae above are correct, insert the numbers from the most recent example.

Example: Three XYZ October 50 calls at a price of 6 were sold against the purchase of 100 XYZ at 49. The number of round lots purchased is 1.

$$\text{Maximum profit} = (50 - 49) \times 1 + 3 \times 6 = 19$$
$$\text{Downside break-even} = 50 - 19/1 = 31$$
$$\text{Upside break-even} = 50 + 19/(3 - 1) = 59\tfrac{1}{2}$$

In the 2:1 ratio writing example given earlier, the break-even points were 37 and 63. The 3:1 write has lower break-even points of 31 and $59\frac{1}{2}$, reflecting the more bearish posture on the underlying stock.

A more bullish write is constructed by buying 200 shares of the underlying stock and writing three calls. To quickly verify that this ratio (3:2) is more bullish, again use 49 for the stock price and 6 for the call price, and now assume that two round lots were purchased.

$$\text{Maximum profit} = (50 - 49) \times 2 + 3 \times 6 = 20$$
$$\text{Downside break-even} = 50 - 20/2 = 40$$
$$\text{Upside break-even} = 50 + 20/(3 - 2) = 70$$

Thus, this ratio of 3 calls against 200 shares of stock has break-even points of 40 and 70, reflecting a more bullish posture on the underlying stock.

A 2:1 ratio may not necessarily be neutral. There is, in fact, a mathematically correct way of determining exactly what a neutral ratio should be. *The neutral ratio is determined by dividing the delta of the written call into 1.* Assume that the delta of the XYZ October 50 call in the previous example is .60. Then the neutral ratio is 1.0/.60, or 5 to 3. This means that one might buy 300 shares and sell 5 calls. Using the formulae above, the details of this position can be observed:

$$\text{Maximum profit} = (50 - 49) \times 3 + 5 \times 6 = 33$$
$$\text{Downside break-even} = 50 - 33/3 = 39$$
$$\text{Upside break-even} = 50 + 33/(5 - 3) = 66\tfrac{1}{2}$$

According to the mathematics of the situation, then, this would be a neutral position initially. It is often the case that a 5:3 ratio is approximately neutral for an at-the-money call.

By now, the reader should have recognized a similarity between the ratio writing strategy and the reverse hedge (or simulated straddle) strategy presented in Chapter 4. The two strategies are the reverse of each other; in fact, this is how the reverse hedge strategy acquired its name. The ratio write has a profit graph that looks like a roof, while the reverse hedge has a profit graph that looks like a trough – the roof upside down. In one strategy the investor buys stock and sells calls, while the other strategy is just the opposite – the investor shorts stock and buys calls. Which one is better? The answer depends on whether the calls are "cheap" or "expensive." Even though ratio writing has limited profits and potentially large losses, the strategy will result in a profit in a large majority of cases, if held to expiration. However, one may be forced to make adjustments to stock moves that occur prior to expiration. The reverse hedge strategy, with its limited losses and potentially large profits, provides profits only on large stock moves – a less frequent event. Thus, in stable markets, the ratio writing strategy is generally superior. However, in times of depressed option premiums, the reverse hedge strategy gains a distinct advantage. If calls are

underpriced, the advantage lies with the buyer of calls, and that situation is inherent in the reverse hedge strategy.

The summaries stated in the above paragraph are rather simplistic ones, referring mostly to what one can expect from the strategies if they are held until expiration, *without adjustment.* In actual trading situations, it is much more likely that one would have to make adjustments to the ratio write along the way, thus disturbing or perhaps even eliminating the profit range. Such travails do not befall the reverse hedge (simulated straddle buy). Consequently, when one takes into consideration the stock movements that can take place *prior to* expiration, the ratio write loses some of its attractiveness and the reverse hedge gains some.

THE VARIABLE RATIO WRITE

In ratio writing, one generally likes to establish the position when the stock is trading relatively close to the striking price of the written calls. However, it is sometimes the case that the stock is nearly exactly between two striking prices and neither the in-the-money nor the out-of-the-money call offers a neutral profit range. If this is the case, and one still wants to be in a 2:1 ratio of calls written to stock owned, he can sometimes write one in-the-money call and one out-of-the-money call against each 100 shares of common. This strategy, often termed a variable ratio write or trapezoidal hedge, serves to establish a more neutral profit range.

Example: Given the following prices: XYZ common, 65; XYZ October 60 call, 8; and XYZ October 70 call, 3.

If one were to establish a 2:1 ratio write with only the October 60's, he would have a somewhat bearish position. His profit range would be 49 to 71 at expiration. Since the stock is already at 65, this means that he would be allowing room for 16 points of downside movement and only 6 points on the upside. This is certainly not neutral. On the other hand, if he were to attempt to utilize only the October 70 calls in his ratio write, he would have a bullish position. This profit range for the October 70 ratio write would be 59 to 81 at expiration. In this case, the stock at 65 is too close to the downside break-even point in comparison to its distance from the upside break-even point.

A more neutral position can be established by buying 100 XYZ and selling one October 60 and one October 70. This position has a profit range that is centered about the current stock price. Moreover, the new position has both an upside and a downside risk, as does a more normal ratio write. However, *now the maximum profit can be obtained anywhere between the two strikes at expiration.* To see this, note

that if XYZ is anywhere between 60 and 70 at expiration, the stock will be called away at 60 against the sale of the October 60 call, and the October 70 call will expire worthless. It makes no difference whether the stock is at 61 or at 69; the same result will occur. Table 6-5 and Figure 6-3 depict the results from this variable hedge at expiration. In the table, it is assumed that the option is bought back at parity to close the position, but if the stock were called away, the results would be the same.

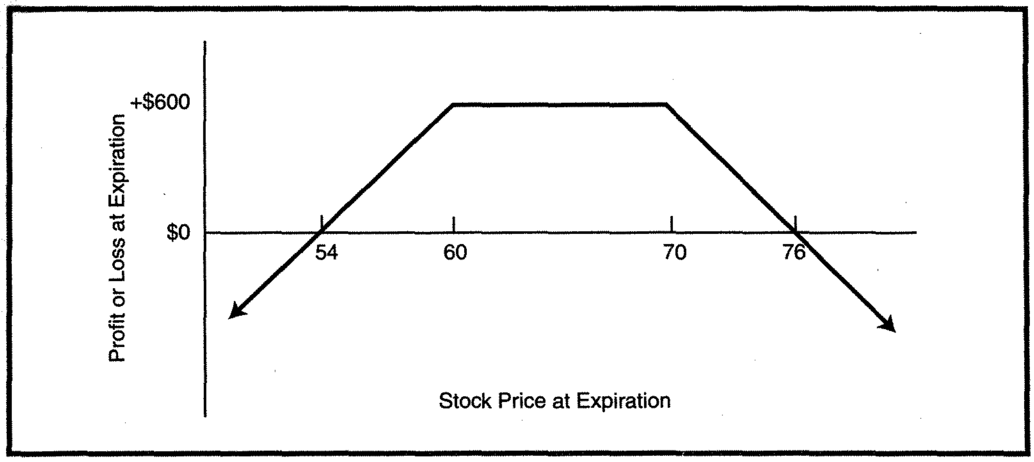
Note that the shape of Figure 6-3 is something like a trapezoid. This is the source of the name "trapezoidal hedge," although the strategy is more commonly known as a variable hedge or variable ratio write. The reader should observe that the maximum profit is indeed obtained if the stock is anywhere between the two strikes at expiration. The maximum profit potential in this position, $600, is smaller than the maximum profit potential available from writing only the October 60's or only the October 70's. However, there is a vastly greater probability of realizing the maximum profit in a variable ratio write than there is of realizing the maximum profit in a normal ratio write.

The break-even points for a variable ratio write can be computed most quickly by first computing the maximum profit potential, which is equal to the time value that the writer takes in. The break-even points are then computed directly by subtracting the points of maximum profit from the lower striking price to get the downside break-even point and adding the points of maximum profit to the upper striking price to arrive at the upside break-even point. This is a similar procedure to that followed for a normal ratio write:

TABLE 6-5.
Results at expiration of variable hedge.

XYZ Price at Expiration	XYZ Profit	October 60 Profit	October 70 Profit	Total Profit
45	−$2,000	+$ 800	+$ 300	−$900
50	− 1,500	+ 800	+ 300	− 400
54	− 1,100	+ 800	+ 300	0
60	− 500	+ 800	+ 300	+ 600
65	0	+ 300	+ 300	+ 600
70	+ 500	− 200	+ 300	+ 600
76	+ 1,100	− 800	− 300	0
80	+ 1,500	−$1,200	− 700	− 400
85	+ 2,000	− 1,700	− 1,200	− 900

FIGURE 6-3.
Variable ratio write (trapezoidal hedge).



Points of maximum profit = Total option premiums + Lower striking price – Stock price
Downside break-even point = Lower striking price – Points of maximum profit
Upside break-even point = Higher striking price + Points of maximum profit

Substituting the numbers from the example above will help to verify the formula. The total points of option premium brought in were 11 (8 for the October 60 and 3 for the October 70). The stock price was 65, and the striking prices involved were 60 and 70.

Points of maximum profit = 11 + 60 – 65 = 6
Downside break-even point = 60 – 6 = 54
Upside break-even point = 70 + 6 = 76

Thus, the break-even points as computed by the formula agree with Table 6-5 and Figure 6-3. Note that the formula applies only if the stock is initially between the two striking prices and the ratio is 2:1. If the stock is above both striking prices, the formula is not correct. However, the writer should not be attempting to establish a variable ratio write with two in-the-money calls.

FOLLOW-UP ACTION

Aside from closing the position completely, there are three reasonable approaches to follow-up action in a ratio writing situation. The first, and most popular, is to roll the written calls up if the stock rises too far, or to roll down if the stock drops too far. A second method uses the delta of the written calls. The third follow-up method is to utilize stops on the underlying stock to alter the ratio of the position as the stock moves either up or down. In addition to these types of defensive follow-up action, the investor must also have a plan in mind for taking profits as the written calls approach expiration. These types of follow-up action are discussed separately.

ROLLING UP OR DOWN AS A DEFENSIVE ACTION

The reader should already be familiar with the definition of a rolling action: The currently written calls are bought back and calls at a different striking price are written. The ratio writer can use rolling actions to his advantage to readjust his position if the underlying stock moves to the edges of his profit range.

The reason one of the selection criteria for a ratio write was the availability of both the next higher and next lower striking prices was to facilitate the rolling actions that might become necessary as a follow-up measure. Since an option has its greatest time premium when the stock price and the striking price are the same, one would normally want to roll exactly at a striking price.

Example: A ratio writer bought 100 XYZ at 49 and sold two October 50 calls at 6 points each. Subsequently, the stock drops in price and the following prices exist: XYZ, 40; XYZ October 50, 1; and XYZ October 40, 4.

One would roll down to the October 40 calls by buying back the 2 October 50's that he is short and selling 2 October 40's. In so doing, he would reestablish a somewhat neutral position. His profit on the buy-back of the October 50 calls would be 5 points each – they were originally sold for 6 – and he would realize a 10-point gain on the two calls. This 10-point gain effectively reduces his stock cost from 49 to 39, so that he now has the equivalent of the following position: long 100 XYZ at 39 and short 2 XYZ October 40 calls at 4. This adjusted ratio write has a profit range of 31 to 49 and is thus a new, neutral position with the stock currently at 40. The investor is now in a position to make profits if XYZ remains near this level, or to take further defensive action if the stock experiences a relatively large change in price again.

Defensive action to the upside – rolling up – works in much the same manner.

Example: The initial position again consists of buying 100 XYZ at 49 and selling two October 50 calls at 6. If XYZ then rose to 60, the following prices might exist: XYZ, 60; XYZ October 50, 11; and XYZ October 60, 6.

The ratio writer could thus roll this position up to reestablish a neutral profit range. If he bought back the two October 50 calls, he would take a 5-point loss on each one for a net loss on the calls of 10 points. This would effectively raise his stock cost by 10 points, to a price of 59. The rolled-up position would then be long 100 XYZ at 59 and short 2 October 60 calls at 6. This new, neutral position has a profit range of 47 to 73 at October expiration.

In both of the examples above, the writer could have closed out the ratio write at a very small profit of about 1 point before commissions. This would not be advisable, because of the relatively large stock commissions, unless he expects the stock to continue to move dramatically. Either rolling up or rolling down gives the writer a fairly wide new profit range to work with, and he could easily expect to make more than 1 point of profit if the underlying stock stabilizes at all.

Having to take rolling defensive action immediately after the position is established is the most detrimental case. If the stock moves very quickly after having set up the position, there will not be much time for time value premium erosion in the written calls, and this will make for smaller profit ranges after the roll is done. It may be useful to use technical support and resistance levels as keys for when to take rolling action if these levels are near the break-even points and/or striking prices.

It should be noted that this method of defensive action – rolling at or near striking prices – automatically means that one is buying back little or no time premium and is selling the greatest amount of time premium currently available. That is, if the stock rises, the call's premium will consist mostly of intrinsic value and very little of time premium value, since it is substantially in-the-money. Thus, the writer who rolls up by buying back this in-the-money call is buying back mostly intrinsic value and is selling a call at the next strike. This newly sold call consists mostly of time value. By continually buying back "real" or intrinsic value and by selling "thin air" or time value, the writer is taking the optimum neutral action at any given time.

If a stock undergoes a dramatic move in one direction or the other, the ratio writer will not be able to keep pace with the dramatic movement by remaining in the same ratio.

Example: If XYZ was originally at 49, but then undergoes a fairly straight-line move to 80 or 90, the ratio writer who maintains a 2:1 ratio will find himself in a deplorable situation. He will have accumulated rather substantial losses on the calls and will not be able to compensate for these losses by the gain in the underlying stock. A similar

situation could arise to the downside. If XYZ were to plunge from 49 to 20, the ratio writer would make a good deal of profit from the calls by rolling down, but may still have a larger loss in the stock itself than the call profits can compensate for.

Many ratio writers who are large enough to diversify their positions into a number of stocks will continue to maintain 2:1 ratios on all their positions and will simply close out a position that has gotten out of hand by running dramatically to the upside or to the downside. These traders believe that the chances of such a dramatic move occurring are small, and that they will take the infrequent losses in such cases in order to be basically neutral on the other stocks in their portfolios.

There is, however, a way to combat this sort of dramatic move. This is done by *altering the ratio* of the covered write as the stock moves either up or down. For example, as the underlying stock moves up dramatically in price, the ratio writer can decrease the number of calls outstanding against his long stock each time he rolls. Eventually, the ratio might decrease as far as 1:1, which is nothing more than a covered writing situation. As long as the stock continues to move in the same upward direction, the ratio writer who is decreasing his ratio of calls outstanding will be giving more and more weight to the stock gains in the ratio write and less and less weight to the call losses. It is interesting to note that this decreasing ratio effect can also be produced by buying extra shares of stock at each new striking price as the stock moves up, and simultaneously keeping the number of outstanding calls written constant. In either case, the ratio of calls outstanding to stock owned is reduced.

When the stock moves down dramatically, a similar action can be taken to increase the number of calls written to stock owned. Normally, as the stock falls, one would sell out some of his long stock and roll the calls down. Eventually, after the stock falls far enough, he would be in a naked writing position. The idea is the same here: As the stock falls, more weight is given to the call profits and less weight is given to the stock losses that are accumulating.

This sort of strategy is more oriented to extremely large investors or to firm traders, market-makers, and the like. Commissions will be exorbitant if frequent rolls are to be made, and only those investors who pay very small commissions or who have such a large holding that their commissions are quite small on a percentage basis will be able to profit substantially from such a strategy.

ADJUSTING WITH THE DELTA

The delta of the written calls can be used to determine the correct ratio to be used in this ratio-adjusting defensive strategy. The basic idea is to use the call's delta to remain as neutral as possible at all times.

Example: An investor initially sets up a neutral 5:3 ratio of XYZ October 50 calls to XYZ stock, as was determined previously. The stock is at 49 and the delta is .60. Furthermore, suppose the stock rises to 57 and the call now has a delta of .80. The neutral ratio would currently be 1/.80 (= 1.20) or 5:4. The ratio writer could thus buy another 100 shares of the underlying stock.

Alternatively, he might buy in one of the short calls. In this particular example, buying in one call would produce a 4:3 ratio, which is not absolutely correct. If he had had a larger position initially, it would be easier to adjust to fractional ratios. When the stock declines, it is necessary to increase the ratio. This can be accomplished by either selling more calls or selling out some of the long stock. In theory, these adjustments could be made constantly to keep the position neutral. In practice, one would allow for a few points of movement by the underlying stock before adjusting. If the underlying stock rises too far, it may be logical for the neutral strategist to adjust by rolling up. Similarly, he would roll down if the stock fell to or below the next lower strike. The neutral ratio in that case is determined by using the delta of the option into which he is rolling.

Example: With XYZ at 57, an investor is contemplating rolling up to the October 60's from his present position of long 300 shares and short 5 XYZ October 50's. If the October 60 has a delta of .40, the neutral ratio for the October 60's is 2.5:1 (1 ÷ .40). Since he is already long 300 shares of stock, he should now be short 7.5 calls (3 × 2.5). Obviously, he would sell 7 or 8, probably depending on his short-term outlook for the stock.

If one prefers to adopt an even more sophisticated approach, he can make adjustments between striking prices by altering his stock position, and can make adjustments by rolling up or down if the stock reaches a new striking price. For those who prefer formulae, the following ones summarize this information:

1. When establishing a new position or when rolling up or down, at the next strike:

$$\text{Number of calls to sell} = \frac{\text{Round lots held long}}{\text{Delta of call to be sold}}$$

   Note: When establishing a new position, one must first decide how many shares of the underlying stock he can buy before utilizing the formula; 1,000 shares would be a workable amount.

2. When adjusting between strikes by buying or selling stock:

Number of round lots to buy = Current delta × Number of short calls − Round lots held long

Note: If a negative number results, stock should be sold, not bought.

These formulae can be verified by using the numbers from the examples above. For example, when the delta of the October 50 was .80 with the stock at 57, it was seen that buying 100 shares of stock would reestablish a neutral ratio.

$$\text{Number of round lots to buy} = .80 \times 5 - 3 = 4 - 3 = 1$$

Also, if the position was to be rolled up to the October 60 (delta = .40), it was seen that 7.5 October 60's would theoretically be sold:

$$\text{Number of calls to sell} = \frac{3}{.40} = 7.5$$

There is a more general approach to this problem, one that can be applied to any strategy, no matter how complicated. It involves computing whether the position is net short or net long. The net position is reduced to an equivalent number of shares of common stock and is commonly called the "equivalent stock position" (ESP). Here is a simple formula for the equivalent stock position of any option position:

$$\text{ESP} = \text{Option quantity} \times \text{Delta} \times \text{Shares per option}$$

Example: Suppose that one is long 10 XYZ July 50 calls, which currently have a delta of .45. The option is an option on 100 shares of XYZ. Thus, the ESP can be computed:

$$\text{ESP} = 10 \times .45 \times 100 = 450 \text{ shares}$$

This is merely saying that owning 10 of these options is equivalent to owning 450 shares of the underlying common stock, XYZ. The reader should already understand this, in that an option with a delta of .45 would appreciate by .45 points if the common stock moved up 1 dollar. Thus, 10 options would appreciate by 4.5 points, or $450. Obviously, 450 shares of common stock would also appreciate by $450 if they moved up by one point.

Note that there are some options – those that result from a stock split – that are for more than 100 shares. The inclusion of the term "shares per option" in the formula accounts for the fact that such options are equivalent to a different amount of stock than most options.

The ESP of an entire option and stock position can be computed, even if several different options are included in the position. The advantage of this simple cal-

culation is that an entire, possibly complex option position can be reduced to one number. The ESP shows how the position will behave for short-term market movements.

Look again at the previous example of a ratio write. The position was long 300 shares and short 5 options with a current delta of .80 after the stock had risen to 57. The ESP of the 5 October 50's is short 400 shares (5 × .80 × 100 shares per option). The position is also long 300 shares of stock, so the total ESP of this ratio write is short 100 shares.

This figure gives the strategist a measure of perspective on his position. He now knows that he has a position that is the equivalent of being short 100 shares of XYZ. Perhaps he is bearish on XYZ and therefore decides to do nothing. That would be fine; at least he knows that his position is short.

Normally, however, the strategist would want to adjust his position. Again returning to the previous example, he has several choices in reducing the ESP back to neutral. An ESP of 0 is considered to be a perfectly neutral position. Obviously, one could buy 100 shares of XYZ to reduce the 100-share delta short. Or, given that the delta of the October 50 call is .80, he could buy in 1.25 of these short calls (obviously he could only buy 1; fractional options cannot be purchased).

Later chapters include more discussions and examples using the ESP. It is a vital concept that no strategist who is operating positions involving multiple options should be without. The only requirement for calculating it is to know the delta of the options in one's position. Those are easily obtainable from one's broker or from a number of computer services, software programs, or Web sites.

For investors who do not have the funds or are not in a position to utilize such a ratio adjusting strategy, there is a less time-consuming method of taking defensive action in a ratio write.

USING STOP ORDERS AS A DEFENSIVE STRATEGY

A ratio writer can use buy or sell stops on his stock position in order to automatically and unemotionally adjust the ratio of his position. This type of defensive strategy is not an aggressive one and will provide some profits unless a whipsaw occurs in the underlying stock.

As an example of how the use of stop orders can aid the ratio writer, let us again assume that the same basic position was established by buying XYZ at 49 and selling two October 50 calls at 6 points each. This produces a profit range of 37 to 63 at expiration. If the stock begins to move up too far or to fall too far, the ratio writer can adjust the ratio of calls short to stock long automatically, through the use of stop orders on his stock.

Example: An investor places a "good until canceled" stop order to buy 100 shares of XYZ at 57 at the same time that he establishes the original position. If XYZ should get to 57, the stop would be set off and he would then own 200 shares of XYZ and be short 2 calls. That is, he would have a 200-share covered write of XYZ October 50 calls.

To see how such an action affects his overall profit picture, note that his average stock cost is now 53; he paid 49 for the first 100 shares and paid 57 for the second 100 shares bought via the stop order. Since he sold the calls at 6 each, he essentially has a covered write in which he bought stock at 53 and sold calls for 6 points. This does not represent a lot of profit potential, but it will ensure some profit unless the stock falls back below the new break-even point. This new break-even point is 47 – the stock cost, 53, less the 6 points received for the call. He will realize the maximum profit potential from the covered write as long as the stock remains above 50 until expiration. Since the stock is already at 57, the probabilities are relatively strong that it will remain above 50, and even stronger that it will remain above 47, until the expiration date. If the buy stop order was placed just above a technical resistance area, this probability is even better.

Hence, *the use of a buy stop order on the upside allows the ratio writer to automatically convert the ratio write into a covered write* if the stock moves up too far. Once the stop goes off, he has a position that will make some profit as long as the stock does not experience a fairly substantial price reversal.

Downside protective action using a sell stop order works in a similar manner.

Example: The investor placed a "good until canceled" sell stop for 100 shares of stock after establishing the original position. If this sell stop were placed at 41, for example, the position would become a naked call writer's position if the stock fell to 41. At that time, the 100 shares of stock that he owned would be sold, at an 8-point loss, but he would have the capability of making 12 points from the sale of his two calls as long as the stock remained below 50 until expiration. In fact, his break-even point after converting into the naked write would actually be 52 at expiration, since at that price, the calls could be bought back for 2 points each, or 8 points total profit, to offset the 8-point loss on the stock. This action limits his profit potential, but will allow him to make some profit as long as the stock does not experience a strong price reversal and climb back above 52 by expiration.

There are several advantages for inexperienced ratio writers to using this method of protection. First, the implementation of the protective strategies – buying an extra 100 shares of stock if the stock moves up, or selling out the 100 shares that are long if the stock moves down – is unemotional *if the stop orders are placed at the*

same time that the original position is established. This prevents the writer from attempting to impose his own market judgment in the heat of battle. That is, if XYZ has moved up to 57, the writer who has not placed a buy stop order may be tempted to wait just a little longer, hoping for the stock to fall in price. If the stop orders are placed as soon as the position is established, a great deal of emotion is removed. Second, *this strategy will produce some profit* – assuming that the stops are properly placed – *as long as the stock does not whipsaw* or experience a price reversal and go back through the striking price in the other direction. Most follow-up actions in any writing strategy, whether they involve rolling actions or the use of stops, are subject to losses if the stock whipsaws back and forth.

The disadvantage to using this type of protective action is that the writer may be tying up relatively large amounts of capital in order to make only a small profit after the stop order is set off. However, in a diversified portfolio, only a small percentage of the stocks may go through their stop points, thereby still allowing the ratio writer plenty of profit potential on his other positions.

Once either the buy stop or the sell stop is set off, the writer still needs to watch the position. *His first action after one stop is touched should be to cancel the other stop order,* because the stops are good orders until they are canceled. From that time on, the writer need do nothing if the stock does not experience a price reversal. In fact, he would just as soon have the stock experience a greater move in the same direction to minimize the chances of a price reversal.

If a price reversal does occur, the most conservative action is to close out the position just after the stock crosses back through the striking price. This will normally result in a small loss, but, again, it should happen in only a relatively small number of his positions. Recall that in a limited profit strategy such as ratio writing, it is important to limit losses as well. If the stock does indeed whipsaw and the position is closed, the writer will still have most of his original equity and can then reestablish a new position in another underlying stock.

Placement of Stops. The writer would ideally like to place his stops at prices that allow a reasonable rate of return to be made, while also having the stops far enough away from the original striking price to reduce the chances of a whipsaw occurring. It is a fairly simple matter to calculate the returns that could be made, after commissions are included, if one or the other of the stops goes off. Dividends should be included as well, since they will accrue to the writer. If the writer is willing to accept returns as low as 5% annually for those positions that go through their stop points, he will be able to place his stops farther from the original striking price. If he feels that he needs a higher return when the stops go off, the stops must be placed closer in. As with any stock or

option investment, the writer who operates in large size will experience less of a commission charge, percentagewise. That is, the writer who is buying 500 shares of stock and selling 10 calls to start with will be able to place his stop points farther out than the writer who is buying 100 shares of stock and selling 2 calls.

Technical analysis can be helpful in selecting the stop points as well. If there is resistance overhead, the buy stop should be placed above that resistance. Similarly, if there is support, the sell stop should be placed beneath the support point. Later, when straddles are discussed, it will be seen that this type of strategy can be operated at less of a net commission charge, since the purchase and sale of stock will not be involved.

CLOSING OUT THE WRITE

The methods of follow-up action discussed above deal with the eventuality of preventing losses. However, if all goes well, the ratio write will begin to accrue profits as the stock remains relatively close to the original striking price. *To retain these paper profits that have accrued, it is necessary to move the protective action points closer together.*

Example: XYZ is at 51 after some time has passed, and the calls are at 3 points each. The writer would, at this time, have an unrealized profit of $800 – $200 from the stock purchase at 49, and $300 each on the two calls, which were originally sold at 6 points each. Recall that the maximum potential profit from the position, if XYZ were exactly at 50 at expiration, is $1,300. The writer would like to adjust the protective points so that nearly all of the $800 paper profit might be retained while still allowing for the profit to grow to the $1,300 maximum.

At expiration, $800 profit would be realized if XYZ were at 45 or at 55. This can be verified by referring again to Table 6-1 and Figure 6-1. The 45 to 55 range is now the area that the writer must be concerned with. The original profit range of 39 to 61 has become meaningless, since the position has performed well to this point in time. If the writer is using the rolling method of protection, he would roll forward to the next expiration series if the stock were to reach 45 or 55. If he is using the stop-out method of protection, he could either close the position at 45 or 55 or he could roll to the next expiration series and readjust his stop points. The neutral strategist using deltas would determine the number of calls to roll forward to by using the delta of the longer-term call.

By moving the protective action points closer together, the ratio writer can then adjust his position while he still has a profit; he is attempting to "lock in" his profit. As even more time passes and expiration draws nearer, it may be possible to move

the protective points even closer together. Thus, as the position continues to improve over time, the writer should be constantly "telescoping" his action points and finally roll out to the next expiration series. This is generally the more prudent move, because the commissions to sell stock to close the position and then buy another stock to establish yet another position may prove to be prohibitive. In summary, then, as a ratio write nears expiration, the writer should be concerned with an ever-narrowing range within which his profits can grow but outside of which his profits could dissipate if he does not take action.

COMMENTS ON DELTA-NEUTRAL TRADING

Since the concept of delta-neutral positions was introduced in this chapter, this is an appropriate time to discuss them in a general way. Essentially, a delta-neutral position is a hedged position in which at least two securities are used – two or more different options, or at least one option plus the underlying. The deltas of the two securities offset each other so that the position starts out with an "equivalent stock position" (ESP) of 0. Another term for ESP is "position delta." Thus, in theory, there is no price risk to begin with; the position is neutral with respect to price movement of the underlying. That definition lasts for about a nanosecond.

As soon as time passes, or the stock moves, or implied volatility changes, the deltas change and therefore the position is no longer delta-neutral. Many people seem to have the feeling that a delta-neutral position is somehow one in which it is easy to make money without predicting the price direction of the underlying. That is not true.

Delta-neutral trading is not "easy": Either (1) one assumes some price risk as soon as the stock begins to move, or (2) one keeps constantly adjusting his deltas to keep them neutral. Method 2 is not feasible for public traders because of commissions. It is even difficult for market-makers, who pay no commissions. Most public practitioners of delta-neutral trading establish a neutral position, but then refrain from adjusting it too often.

A common mistake that novice traders make with delta-neutral trading is to *short* options in a neutral manner, figuring that they have little exposure to price change because the position is delta-neutral. However, a sizeable move by the underlying (which often happens in a short period of time) ruins the neutrality of the position and inevitably costs the trader a lot of money. A simple example: If one sells a naked straddle (i.e., he sells a naked put and a naked call with both having the same striking price) with the stock initially just below the strike price, that's a delta-neutral

position. However, the position has naked options on both sides, and therefore has tremendous liability.

In practice, professionals watch more than just the delta; they also watch other measures of the risk of a position. Even then, price and volatility changes can cause problems. Advanced risk concepts are addressed more fully in the chapter on Advanced Concepts.

SUMMARY

Ratio writing is a viable, neutral strategy that can be employed with differing levels of sophistication. The initial ratio of short calls to long stock can be selected simplistically by comparing one's opinion for the underlying stock with projected break-even points from the position. In a more sophisticated manner, the delta of the written calls can be used to determine the ratio.

Since the strategy has potentially large losses either to the upside or the downside, follow-up action is mandatory. This action can be taken by simple methods such as rolling up or down in a constant ratio, or by placing stop orders on the underlying stock. A more sophisticated technique involves using the delta of the option to either adjust the stock position or roll to another call. By using the delta, a theoretically neutral position can be maintained at all times.

Ratio writing is a relatively sophisticated strategy that involves selling naked calls. It is therefore not suitable for all investors. Its attractiveness lies in the fact that vast quantities of time value premium are sold and the strategy is profitable for the most probable price outcomes of the underlying stock. It has a relatively large probability of making a limited profit, if the position can be held until expiration without frequent adjustment.

AN INTRODUCTION TO CALL SPREAD STRATEGIES

A *spread* is a transaction in which one simultaneously buys one option and sells another option, with different terms, on the same underlying security. In a call spread, the options are all calls. The basic idea behind spreading is that the strategist is using the sale of one call to reduce the risk of buying another call. The short call in a spread is considered covered, for margin purposes, only if the long call has an expiration date equal to or longer than the short call. Before delving into the individual types of spreads, it may be beneficial to cover some general facts that pertain to most spread situations.

All spreads fall into three broad categories: *vertical, horizontal,* or *diagonal.* A *vertical spread* is one in which the calls involved have the same expiration date but different striking prices. An example might be to buy the XYZ October 30 and sell the October 35 simultaneously. A *horizontal spread* is one in which the calls have the same striking price but different expiration dates. This is a horizontal spread: Sell the XYZ January 35 and buy the XYZ April 35. A *diagonal spread* is any combination of vertical and horizontal and may involve calls that have different expiration dates as well as different striking prices. These three names that classify the spreads can be related to the way option prices are listed in any newspaper summary of closing option prices. A vertical spread involves two options from the same column in a newspaper listing. Newspaper columns run vertically. A horizontal spread involves two calls whose prices are listed in the same row in a newspaper listing; rows are horizontal. This relationship to the listing format in newspapers is not important, but it is an easy way to remember what vertical spreads and horizontal spreads are. There are many types of vertical and horizontal spreads, and several of them are discussed in detail in later chapters.

SPREAD ORDER

The term "spread" designates not only a type of strategy, but a type of order as well. *All spread transactions in which both sides of the spread are opening (initial) transactions must be done in a margin account.* This means that the customer must generally maintain a minimum equity in the account, normally $2,000. Some brokerage houses may also have a maintenance requirement, or "kicker."

It *is* possible to transact a spread in a cash account, but one of the sides must be a closing transaction. In fact, many of the follow-up actions taken in the covered writing strategy are actually spread transactions. Suppose a covered writer is currently short one XYZ April call against 100 shares of the underlying stock. If he wants to roll forward to the July 35 call, he will be buying back the April 35 and selling the July 35 simultaneously. This is a spread transaction, technically, since one call is being bought and the other is being sold. However, in this transaction, the buy side is a closing transaction and the sell side is an opening transaction. This type of spread could be done in a cash account. Whenever a covered writer is rolling – up, down, or forward – he should place the order as a spread order to facilitate a better price execution.

The spreads discussed in the following chapters are predominantly spread strategies, ones in which both sides of the spread are opening transactions. These are designed to have their own profit and risk potentials, and are not merely follow-up actions to some previously discussed strategy.

When a spread order is entered, the options being bought and sold must be specified. Two other items must be specified as well: the price at which the spread is to be executed, and whether that price is a credit or a debit. If the total price of the spread results in a cash inflow to the spread strategist, the spread is a *credit spread.* This merely means that the sell side of the spread brings in a higher price than is paid for the buy side of the spread. If the reverse is true – that is, there is a cash outflow from the spread transaction – the spread is said to be a *debit spread.* This means that the buy side of the spread costs more than is received from the sell side. It is also common to refer to the purchased side of the spread as the *long side* and to refer to the written side of the spread as the *short side.*

The price at which a certain spread can be executed is generally *not* the difference between the last sale prices of the two options involved in the spread.

Example: An investor wants to buy an XYZ October 30 and simultaneously sell an XYZ October 35 call. If the last sale price of the October 30 was 4 points and the last sale price of the October 35 was 2 points, it does not necessarily mean that the spread could be done for a 2-point debit (the difference in the last sale prices). In fact, *the only way to determine the market price for a spread transaction is to know what the bid and asked prices of the options involved are.* Suppose the following quotes are available on these two calls:

	Bid	Asked	Last Sale
October 30 call	3⅞	4⅛	4
October 35 call	1⅞	2	2

Since the spread in question involves buying the October 30 call and selling the October 35, the spreader will, at market, have to pay 4⅛ for the October 30 (the asked or offering quote) and will receive only 1⅞ (the bid quote) for the October 35. This results in a debit of 2¼ points, significantly more than the 2-point difference in the last sale prices. Of course, one is free to specify any price he wants for any type of transaction. One might enter this spread order at a 2⅛-point debit and could have a reasonable chance of having the order filled if the floor broker can do better than the bid side on the October 35 or better than the offering side on the October 30.

The point to be learned here is that *one cannot assume that last sale prices are indicative of the price at which a spread transaction can be executed.* This makes computer analysis of spread transactions via closing price data somewhat difficult. Some computer data services offer (generally at a higher cost) closing bid and asked prices as well as closing sale prices. If a strategist is forced to operate with closing

prices only, however, he should attempt to build some screens into his output to allow for the fact that last sale prices might not be indicative of the price at which the spread can be executed. One simple method for screening is to look only at relatively liquid options – that is, those that have traded a substantial number of contracts during the previous trading day. If an option is experiencing a great deal of trading activity, there is a much better chance that the current quote is "tight," meaning that the bid and offering prices are quite close to the last sale price.

In the early days of listed options, it was somewhat common practice to "leg" into a spread. That is, the strategist would place separate buy and sell orders for the two transactions comprising his spread. As the listed markets have developed, adding depth and liquidity, *it is generally a poor idea to leg into a spread.* If the floor broker handling the transaction knows the entire transaction, he has a much better chance of "splitting a quote," buying on the bid, or selling on the offering. *Splitting a quote* merely means executing at a price that is between the current bid and asked prices. For example, if the bid is 3⅞ and the offering is 4⅛, a transaction at a price of 4 would be "splitting the quote."

The public customer must be aware that spread transactions may involve substantially higher commission costs, because there are twice as many calls involved in any one transaction. Some brokers offer slightly lower rates for spread transactions, but these are not nearly as low as spreads in commodity trading, for example.

CHAPTER 7

Bull Spreads

The *bull spread* is one of the most popular forms of spreading. In this type of spread, one buys a call at a certain striking price and sells a call at a higher striking price. Generally, both options have the same expiration date. This is a vertical spread. *A bull spread tends to be profitable if the underlying stock moves up in price; hence, it is a bullish position.* The spread has both limited profit potential and limited risk. Although both can be substantial percentagewise, the risk can never exceed the net investment. In fact, a bull spread requires a smaller dollar investment and therefore has a smaller maximum dollar loss potential than does an outright call purchase of a similar call.

Example: The following prices exist:

XYZ common, 32;

XYZ October 30 call, 3; and

XYZ October 35 call, 1.

A bull spread would be established by buying the October 30 call and simultaneously selling the October 35 call. Assume that this could be done at the indicated 2-point debit. A *call bull spread is always a debit transaction,* since the call with the lower striking price must always trade for more than a call with a higher price, if both have the same expiration date. Table 7-1 and Figure 7-1 depict the results of this transaction at expiration. The indicated call profits or losses would be realized if the calls were liquidated at parity at expiration. Note that *the spread has a maximum profit and this profit is realized if the stock is anywhere above the higher striking price at expiration.* The maximum loss is realized if the stock is anywhere below the lower strike at expiration, and is equal to the net investment, 2 points in this example.

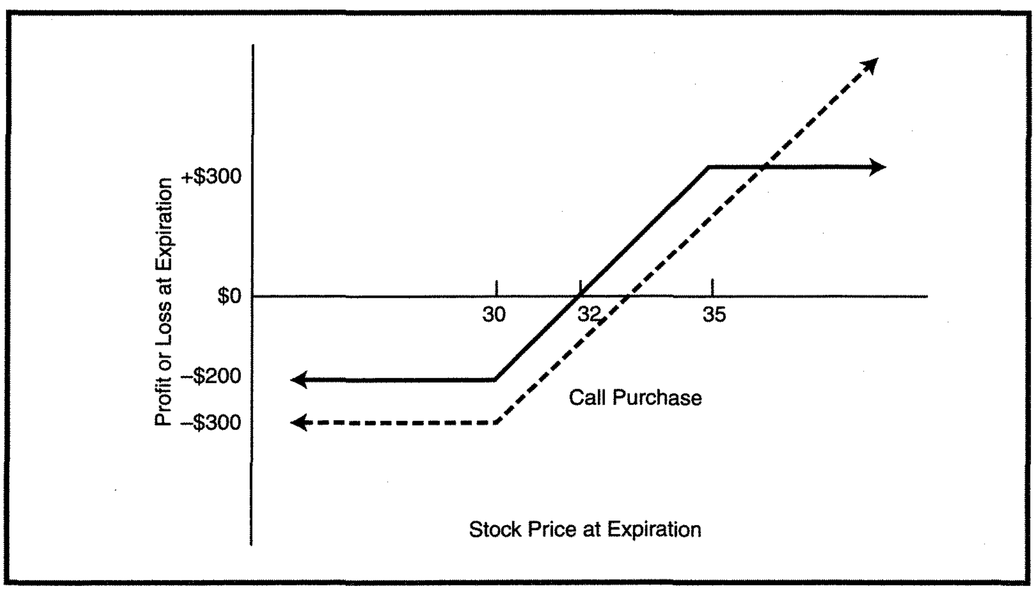
Moreover, there is a break-even point that always lies between the two striking prices at expiration. In this example, the break-even point is 32. All bull spreads have profit graphs with the same shape as the one shown in Figure 7-1 when the expiration dates are the same for both calls.

The investor who establishes this position is bullish on the underlying stock, but is generally looking for a way to hedge himself. If he were rampantly bullish, he

TABLE 7-1.
Results at expiration of bull spread.

XYZ Price at Expiration	October 30 Profit	October 35 Profit	Total Profit
25	–$ 300	+$100	–$200
30	– 300	+ 100	– 200
32	– 100	+ 100	0
35	+ 200	+ 100	+ 300
40	+ 700	– 400	+ 300
45	+ 1,200	– 900	+ 300

FIGURE 7-1.
Bull spread.



would merely buy the October 30 call outright. However, the sale of the October 35 call against the purchase of the October 30 allows him to take a position that will outperform the outright purchase of the October 30, dollarwise, as long as the stock does not rise above 36 by expiration. This fact is demonstrated by the dashed line in Figure 7-1.

Therefore, the strategist establishing the bull spread is bullish, but not overly so. To verify that this comparison is correct, note that if one bought the October 30 call outright for 3 points, he would have a 3-point profit at expiration if XYZ were at 36. Both strategies have a 3-point profit at 36 at expiration. Below 36, the bull spread does better because the sale of the October 35 call brings in the extra point of premium. Above 36 at expiration, the outright purchase outperforms the bull spread, because there is no limit on the profits that can occur in an outright purchase situation.

The net investment required for a bull spread is the net debit plus commissions. Since the spread must be transacted in a margin account, there will generally be a minimum equity requirement imposed by the brokerage firm. In addition, there may be a maintenance requirement by some brokers. Suppose that one was establishing 10 spreads at the prices given in the example above. His investment, before commissions, would be \$2,000 (\$200 per spread), plus commissions. It is a simple matter to compute the break-even point and the maximum profit potential of a call bull spread:

$$\text{Break-even point} = \text{Lower striking price} + \text{Net debit of spread}$$

$$\text{Maximum profit potential} = \text{Higher striking price} - \text{Lower striking price} - \text{Net debit of spread}$$

In the example above, the net debit was 2 points. Therefore, the break-even point would be 30 + 2, or 32. The maximum profit potential would be 35 – 30 – 2, or 3 points. These figures agree with Table 7-1 and Figure 7-1. *Commissions may represent a significant percentage of the profit and net investment,* and should therefore be calculated before establishing the position. If these commissions are included in the net debit to establish the spread, they conveniently fit into the preceding formulae. Commission charges can be reduced percentagewise by spreading a larger quantity of calls. For this reason, it is generally advisable to spread at least 5 options at a time.

DEGREES OF AGGRESSIVENESS

AGGRESSIVE BULL SPREAD

Depending on how the bull spread is constructed, it may be an extremely aggressive or more conservative position. The most commonly used bull spread is of the *aggressive* type; the stock is generally well below the higher striking price when the spread is established. This aggressive bull spread generally has the ability to generate substantial percentage returns if the underlying stock should rise in price far enough by expiration. *Aggressive bull spreads are most attractive when the underlying common stock is relatively close to the lower striking price at the time the spread is established.* A bull spread established under these conditions will generally be a low-cost spread with substantial profit potential, even after commissions are included.

EXTREMELY AGGRESSIVE BULL SPREAD

An extremely aggressive type of bull spread is the "out-of-the-money" spread. In such a spread, *both* calls are out-of-the-money when the spread is established. These spreads are extremely inexpensive to establish and have large potential profits if the stock should climb to the higher striking price by expiration. However, they are usually quite deceptive in nature. The underlying stock has only a relatively remote chance of advancing such a great deal by expiration, and the spreader could realize a 100% loss of his investment even if the underlying stock advances moderately, since both calls are out-of-the-money. This spread is akin to buying a deeply out-of-the-money call as an outright speculation. It is not recommended that such a strategy be pursued with more than a very small percentage of one's speculative funds.

LEAST AGGRESSIVE BULL SPREAD

Another type of bull spread can be found occasionally – the "in-the-money" spread. In this situation, both calls are in-the-money. This is a much less aggressive position, since it offers a large probability of realizing the maximum profit potential, although that profit potential will be substantially smaller than the profit potentials offered by the more aggressive bull spreads.

Example: XYZ is at 37 some time before expiration, and the October 30 call is at 7 while the October 35 call is at 4. Both calls are in-the-money and the spread would cost 3 points (debit) to establish. The maximum profit potential is 2 points, but it would be realized as long as XYZ were above 35 at expiration. That is, XYZ could *fall* by 2 points and the spreader would still make his maximum profit. This is certainly a more conservative position than the aggressive spread described above. The com-

mission costs in this spread would be substantially larger than those in the spreads above, which involve less expensive options initially, and they should therefore be figured into one's profit calculations before entering into the spread transaction. Since this stock would have to decline 7 points to fall below 30 and cause a loss of the entire investment, it would have to be considered a rather low-probability event. This fact adds to the less aggressive nature of this type of spread.

RANKING BULL SPREADS

To accurately compare the risk and reward potentials of the many bull spreads that are available in a given day, one has to use a computer to perform the mass calculations. It is possible to use a strictly arithmetic method of ranking bull spreads, but such a list will not be as accurate as the correct method of analysis. In reality, it is necessary to incorporate the volatility of the underlying stock, and possibly the expected return from the spread as well, into one's calculations. The concept of expected return is described in detail in Chapter 28, where a bull spread is used as an example.

The exact method for using volatility and predicting an option's price after an upward movement are presented later. Many data services offer such information. However, if the reader wants to attempt a simpler method of analysis, the following one may suffice. In any ranking of bull spreads, *it is important not to rank the spreads by their maximum potential profits at expiration.* Such a ranking will always give the most weight to deeply out-of-the-money spreads, which can rarely achieve their maximum profit potential. It would be better to screen out any spreads whose maximum profit prices are too far away from the current stock price. A simple method of allowing for a stock's movement might be to assume that the stock could, at expiration, advance by an amount equal to twice the time value premium in an at-the-money call. Since more volatile stocks have options with greater time value premium, this is a simple attempt to incorporate volatility into the analysis. Also, since longer-term options have more time value premium than do short-term options, this will allow for larger movements during a longer time period. Percentage returns should include commission costs. This simple analysis is not completely correct, but it may prove useful to those traders looking for a simple arithmetic method of analysis that can be computed quickly.

FURTHER CONSIDERATIONS

The bull spreads described in previous examples utilize the same expiration date for both the short call and the long call. It is sometimes useful to buy a call with a longer

time to maturity than the short call has. Such a position is known as a diagonal bull spread and is discussed in a later chapter.

Experienced traders often turn to bull spreads when options are expensive. The sale of the option at the higher strike partially mitigates the cost of buying an expensive option at the lower strike. However, one should not always use the bull spread approach just because the options have a lot of time value premium, for he would be giving up a lot of upside profit potential in order to have a hedged position.

With most types of spreads, it is necessary for some time to pass for the spread to become significantly profitable, even if the underlying stock moves in favor of the spreader. For this reason, *bull spreads are not for traders* unless the options involved are very short-term in nature. If a speculator is bullishly oriented for a short-term upward move in an underlying stock, it is generally better for him to buy a call outright than to establish a bull spread. Since the spread differential changes mainly as a function of time, small movements in price by the underlying stock will not cause much of a short-term change in the price of the spread. However, the bull spread has a distinct advantage over the purchase of a call if the underlying stock advances moderately *by expiration.*

In the previous example, a bull spread was established by buying the XYZ October 30 call for 3 points and simultaneously selling the October 35 call for 1 point. This spread can be compared to the outright purchase of the XYZ October 30 alone. There is a short-term advantage in using the outright purchase.

Example: The underlying stock jumps from 32 to 35 in one day's time. The October 30 would be selling for approximately $5\frac{1}{2}$ points if that happened, and the outright purchaser would be ahead by $2\frac{1}{2}$ points, less one option commission. The long side of the bull spread would do as well, of course, since it utilizes the same option, but the short side, the October 35, would probably be selling for about $2\frac{1}{2}$ points. Thus, the bull spread would be worth 3 points in total ($5\frac{1}{2}$ points on the long side, less $2\frac{1}{2}$ points loss on the short side). This represents a 1-point profit to the spreader, less two option commissions, since the spread was initially established at a debit of 2 points. Clearly, then, for the shortest time period – one day – the outright purchase outperforms the bull spread on a quick rise.

For a slightly longer time period, such as 30 days, the outright purchase still has the advantage if the underlying stock moves up quickly. Even if the stock should advance above 35 in 30 days, the bull spread will still have time premium in it and thus will not yet have reached its maximum spread potential of 5 points. Recall that the maximum potential of a bull spread is always equal to the difference between the striking prices. Clearly, the outright purchaser will do very well if the underlying stock should advance that far in 30 days' time. When risk is considered, however, it

must be pointed out that the bull spread has fewer dollars at risk and, if the underlying stock should drop rather than rise, the bull spread will often have a smaller loss than the outright call purchase would.

The longer it takes for the underlying stock to advance, the more the advantage swings to the spread. Suppose XYZ does not get to 35 until expiration. In this case, the October 30 call would be worth 5 points and the October 35 call would be worthless. The outright purchase of the October 30 call would make a 2-point profit less one commission, but the spread would now have a 3-point profit, less two commissions. Even with the increased commissions, the spreader will make more of a profit, both dollarwise and percentagewise.

Many traders are disappointed with the low profits available from a bull spread when the stock rises almost immediately after the position is established. One way to partially offset the problem with the spread not widening out right away is to use a greater distance between the two strikes. When the distance is great, the spread has room to widen out, even though it won't reach its maximum profit potential right away. Still, since the strikes are "far apart," there is more room for the spread to widen even if the underlying stock rises immediately.

The conclusion that can be drawn from these examples is that, in general, the outright purchase is a better strategy if one is looking for a quick rise by the underlying stock. Overall, the bull spread is a less aggressive strategy than the outright purchase of a call. The spread will not produce as much of a profit on a short-term move, or on a sustained, large upward move. It will, however, outperform the outright purchase of a call if the stock advances slowly and moderately by expiration. Also, the spread always involves fewer actual dollars of risk, because it requires a smaller debit to establish initially. Table 7-2 summarizes which strategy has the upper hand for various stock movements over differing time periods.

TABLE 7-2.
Bull spread and outright purchase compared.

	If the underlying stock...			
	Declines	Remains Relatively Unchanged	Advances Moderately	Advances Substantially
in...				
1 week	Bull spread	Bull spread	Outright purchase	Outright purchase
1 month	Bull spread	Bull spread	Outright purchase	Outright purchase
At expiration	Bull spread	Bull spread	Bull spread	Outright purchase

FOLLOW-UP ACTION

Since the strategy has both limited profit and limited risk, it is not mandatory for the spreader to take any follow-up action prior to expiration. If the underlying stock advances substantially, the spreader should watch the time value premium in the short call closely in order to close the spread if it appears that there is a possibility of assignment. This possibility would increase substantially if the time value premium disappeared from the short call. If the stock falls, the trader may want to close the spread in order to limit his losses even further.

When the spread is closed, the order should also be entered as a spread transaction. If the underlying stock has moved up in price, the order to liquidate would be a *credit* spread involving two closing transactions. *The maximum credit that can be recovered from a bull spread is an amount equal to the difference between the striking prices.* In the previous example, if XYZ were above 35 at expiration, one might enter an order to liquidate the spread as follows: Buy the October 35 (it is common practice to specify the buy side of a spread first when placing an order); sell the October 30 at a 5-point credit. In reality, because of the difference between bids and offers, it is quite difficult to obtain the entire 5-point credit even if expiration is quite near. Generally, one might ask for a $4^3/_4$ or $4^7/_8$ credit. It is possible to close the spread via exercise, although this method is normally advisable only for traders who pay little or no commissions. If the short side of a spread is assigned, the spreader may satisfy the assignment notice by exercising the long side of his spread. There is no margin required to do so, but there are stock commissions involved. Since these stock commissions to a public customer would be substantially larger than the option commissions involved in closing the spread by liquidating the options, *it is recommended that the public customer attempt to liquidate rather than exercise.*

A minor point should be made here. Since the amount of commissions paid to liquidate the spread would be larger if higher call prices are involved, the actual net maximum profit point for a bull spread is for the stock to be exactly at the higher striking price at expiration. If the stock exceeds the higher striking price by a great deal, the gross profit will be the same (it was demonstrated earlier that this gross profit is the same anywhere above the higher strike at expiration), but the net profit will be slightly smaller, since the investor will pay more in commissions to liquidate the spread.

Some spreaders prefer to buy back the short call if the underlying stock drops in price, in order to lock in the profit on the short side. They will then hold the long call in hopes of a rise in price by the underlying stock, in order to make the long side of the spread profitable as well. This amounts to "legging" out of the spread, although

the overall increase in risk is small – the amount paid to repurchase the short call. If he attempts to "leg" out of the spread in such a manner, the spreader should not attempt to buy back the short call at too high a price. If it can be repurchased at $1/8$ or $1/16$, the spreader will be giving away virtually nothing by buying back the short call. However, he should not be quick to repurchase it if it still has much more value than that, unless he is closing out the entire spread. At no time should one attempt to "leg" out after a stock price increase, taking the profit on the long side and hoping for a stock price decline to make the short side profitable as well. The risk is too great.

Many traders find themselves in the somewhat perplexing situation of having seen the underlying make a large, quick move, only to find that their spread has not widened out much. They often try to figure out a way to perhaps lock in some gains in case the underlying subsequently drops in price, but they want to be able to wait around for the spread to widen out more toward its maximum profit potential. There really isn't any hedge that can accomplish all of these things. The only position that can lock in the profits in a call bull spread is to purchase the accompanying *put* bear spread. This strategy is discussed in Chapter 23, Spreads Combining Calls and Puts.

OTHER USES OF BULL SPREADS

Superficially, the bull spread is one of the simplest forms of spreading. However, it can be an extremely useful tool in a wide variety of situations. Two such situations were described in Chapter 3. If the outright purchaser of a call finds himself with an unrealized loss, he may be able to substantially improve his chances of getting out even by "rolling down" into a bull spread. If, however, he has an unrealized profit, he may be able to sell a call at the next higher strike, creating a bull spread, in an attempt to lock in some of his profit.

In a somewhat similar manner, a common stockholder who is faced with an unrealized loss may be able to utilize a bull spread to lower the price at which he can break even. He may often have a significantly better chance of breaking even or making a profit by using options. The following example illustrates the stockholder's strategy.

Example: An investor buys 100 shares of XYZ at 48, and later finds himself with an unrealized loss with the stock at 42. A 6-point rally in the stock would be necessary in order to break even. However, if XYZ has listed options trading, he may be able to significantly reduce his break-even price. The prices are:

XYZ common, 42;
XYZ October 40, 4; and
XYZ October 45, 2.

The stock owner could enhance his overall position by buying one October 40 call and selling *two* October 45 calls. Note that no extra money, except commissions, is required for this transaction, because the credit received from selling two October 45's is $400 and is equal to the cost of buying the October 40 call. However, maintenance and equity requirements still apply, because a spread has been established.

The resulting position does not have an uncovered, or naked, option in it. One of the October 45 calls that was sold is covered by the underlying stock itself. The other is part of a bull spread with the October 40 call. It is not particularly important that the resulting position is a combination of both a bull spread and a covered write. What is important is the profit characteristic of this new total position.

If XYZ should continue to decline in price and be below 40 at October expiration, all the calls will expire worthless, and the resulting loss to the stock owner will be the same (except for the option commissions spent) as if he had merely held onto his stock without having done any option trading.

Since both a covered write and a bull spread are strategies with limited profit potential, *this new position obviously must have a limited profit.* If XYZ is anywhere above 45 at October expiration, the maximum profit will be realized. To determine the size of the maximum profit, assume that XYZ is at exactly 45 at expiration. In that case, the two short October 45's would expire worthless and the long October 40 call would be worth 5 points. The option trades would have resulted in a $400 profit on the short side ($200 from each October 45 call) plus a $100 profit on the long side, for a total profit of $500 from the option trades. Since the stock was originally bought at 48 in this example, the stock portion of the position is a $300 loss with XYZ at 45 at expiration. The overall profit of the position is thus $500 less $300, or $200.

For stock prices between 40 and 45 at expiration, the results are shown in Table 7-3 and Figure 7-2. Figure 7-2 depicts the two columns from the table labeled "Profit on Stock" and "Total Profit," so that one can visualize how the new total position compares with the original stockholder's profit. Several points should be noted from either the graph or the table. First, the break-even point is lowered from 48 to 44. The new total position breaks even at 44, so that only a 2-point rally by the stock by expiration is necessary in order to break even. The two strategies are equal at 50 at expiration. That is, the stock would have to rally more than 8 points, from 42 to 50, by expiration for the original stockholder's position to outperform the new posi-

TABLE 7-3.
Lowering the break-even price on common stock.

XYZ Price at Expiration	Profit on Stock	Profit on Short October 45's	Profit on Long October 40	Total Profit
35	−$1,300	+$400	−$400	−$1,300
38	− 1,000	+ 400	− 400	− 1,000
40	− 800	+ 400	− 400	− 800
42	− 600	+ 400	− 200	− 400
43	− 500	+ 400	− 100	− 200
44	− 400	+ 400	0	0
45	− 300	+ 400	+ 100	+ 200
48	0	− 200	+ 400	+ 200
50	+ 200	− 600	+ 600	+ 200

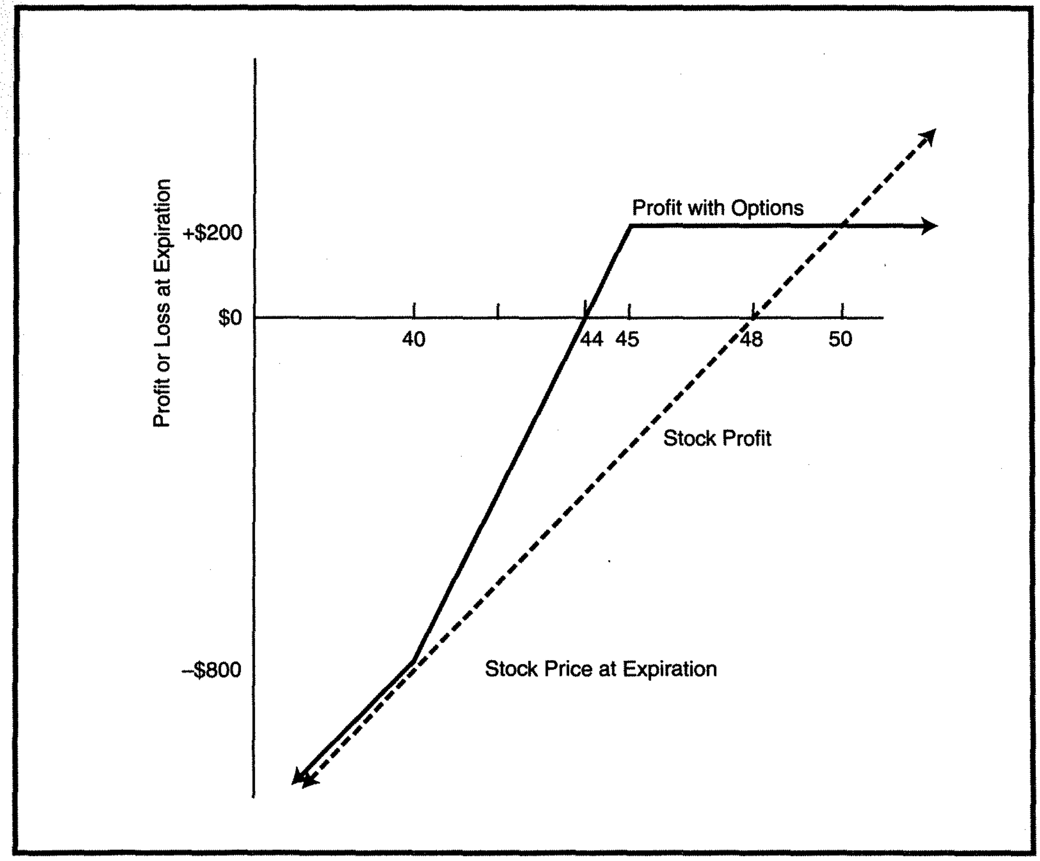
tion. Below 40, the two strategies produce the same result. Finally, between 40 and 50, the new position outperforms the original stockholder's position.

In summary, then, the stockholder stands to gain much and gives away very little by adding the indicated options to his stock position. If the stock stabilizes at all – anywhere between 40 and 50 in the example above – the new position would be an improvement. Moreover, the investor can break even or make profits on a small rally. If the stock continues to drop heavily, nothing additional will be lost except for option commissions. Only if the stock rallies very sharply will the stock position outperform the total position.

This strategy – combining a covered write and a bull spread – is sometimes used as an initial (opening) trade as well. That is, an investor who is considering buying XYZ at 42 might decide to buy the October 40 and sell two October 45's (for even money) at the outset. The resulting position would not be inferior to the outright purchase of XYZ stock, in terms of profit potential, unless XYZ rose above 46 by October expiration.

Bull spreads may also be used as a "substitute" for covered writing. Recall from Chapter 2 that writing against warrants can be useful because of the smaller investment required, especially if the warrant was in-the-money and was not selling at much of a premium. The same thinking applies to call options. *If there is an in-the-money call with little or no time premium remaining in it, its purchase may be used as a substitute for buying the stock itself.* Of course, the call will expire, whereas the stock will not; but the profit potential of owning a deeply in-the-money call can be

FIGURE 7-2.
Lowering the break-even price on common stock.



very similar to owning the stock. Since such a call costs less to purchase than the stock itself would, the buyer is getting essentially the same profit or loss potential with a smaller investment. It is natural, then, to think that one might write another call – one closer to the money – against the deeply in-the-money purchased call. This position would have profit characteristics much like a covered write, since the long call "simulates" the purchase of stock. This position really is, of course, a bull spread, in which the purchased call is well in-the-money and the written call is closer to the money. Clearly, one would not want to put all of his money into such a strategy and forsake covered writing, since, with bull spreads, he could be entirely wiped out in a moderate market decline. In a covered writing strategy, one still owns the stocks even after a severe market decline. However, one may achieve something of a compromise by investing a much smaller amount of money in bull spreads than he might have invested in covered writes. He can still retain the same profit potential. The balance of the investor's funds could then be placed in interest-bearing securities.

Example: The following prices exist:

XYZ common, 49;
XYZ April 50 call, 3; and
XYZ April 35 call, 14.

Since the deeply in-the-money call has no time premium, its purchase will perform much like the purchase of the stock until April expiration. Table 7-4 summarizes the profit potential from the covered write or the bull spread. The profit potentials are the same from a cash covered write or the bull spread. Both would yield a $400 profit before commissions if XYZ were above 50 at April expiration. However, since the bull spread requires a much smaller investment, the spreader could put $3,500 into interest-bearing securities. This interest could be considered the equivalent of receiving the dividends on the stock. In any case, the spreader can lose only $1,100, even if the stock declines substantially. The covered writer could have a larger unrealized loss than that if XYZ were below 35 at expiration. Also, in the bull spread situation, the writer can "roll down" the April 50 call if the stock declines in price, just as he might do in a covered writing situation.

TABLE 7-4.
Results for covered write and bull spread compared.

	Covered Write: Buy XYZ and Sell April 50 Call	Bull Spread: Buy XYZ April 35 Call and Sell April 50 Call
Maximum profit potential (stock over 50 in April)	$ 400	$ 400
Break-even point	46	46
Investment	$4,600	$1,100

Thus, the bull spread offers the same dollar rewards, the same break-even point, smaller commission costs, less potential risk, and interest income from the fixed-income portion of the investment. While it is not always possible to find a deeply in-the-money call to use as a "substitute" for buying the stock, when one does exist, the strategist should consider using the bull spread instead of the covered write.

SUMMARY

The bull spread is one of the simplest and most popular forms of spreading. It will generally perform best in a moderately bullish environment. A bull spread will not widen out to its maximum profit potential right away, though; so for short-term trades, the outright purchase of a call is a better choice. The bull spread can also be applied for more sophisticated purposes in a far wider range of situations than merely wanting to attempt to capitalize on a moderate advance by the underlying stock. Both call buyers and stock buyers may be able to use bull spreads to "roll down" and produce lower break-even points for their positions. The covered writer may also be able to use bull spreads as a substitute for covered writes in certain situations in which a deeply in-the-money call exists.

CHAPTER 8

Bear Spreads Using Call Options

Options are versatile investment vehicles. For every type of bullish position that can be established, there is normally a corresponding bearish type of strategy. For every neutral strategy, there is an aggressive strategy for the investor with an opposite opinion. One such case has already been explored in some detail; the straddle buy or reverse hedge strategy is the opposite side of the spectrum. For many of the strategies to be described from this point on, there is a corresponding strategy designed for the strategist with the opposite point of view. In this vein, a bear spread is the opposite of a bull spread.

THE BEAR SPREAD

In a call bear spread, one buys a call at a certain striking price and sells a call at a lower striking price. This is a vertical spread, as was the bull spread. The bear spread tends to be profitable if the underlying stock declines in price. Like the bull spread, it has limited profit and loss potential. However, unlike the bull spread, the bear spread is a *credit* spread when the spread is set up with call options. Since one is selling the call with the lower strike, and a call at a lower strike always trades at a higher price than a call at a higher strike with the same expiration, the bear spread must be a credit position. It should be pointed out that most bearish strategies that can be established with call options may be more advantageously constructed using put options. Many of these same strategies are therefore discussed again in Part III.

Example: An investor is bearish on XYZ. Using the same prices that were used for the examples in Chapter 7, an example of a bear spread can be constructed for:

XYZ common, 32;

XYZ October 30 call, 3; and

XYZ October 35 call, 1.

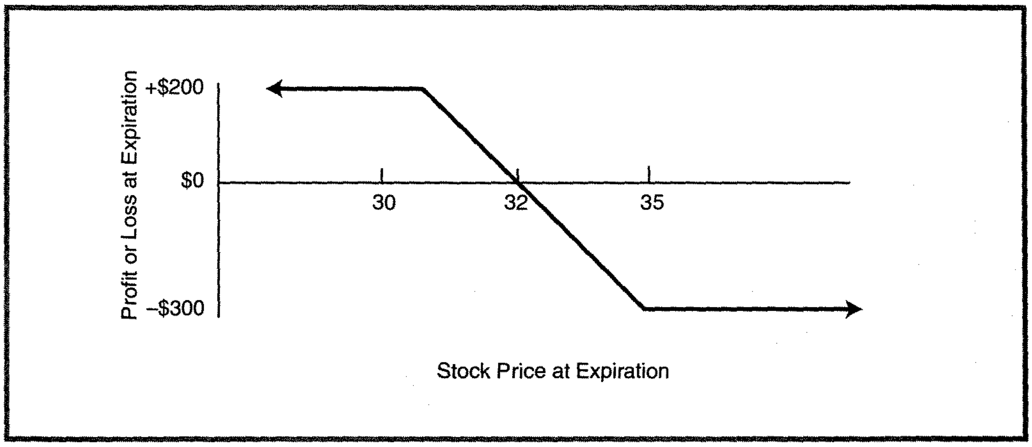
A bear spread would be established by buying the October 35 call and selling the October 30 call. This would be done for a 2-point credit, before commissions. *In a bear spread situation, the strategist is hoping that the stock will drop in price and that both options will expire worthless.* If this happens, he will not have to pay anything to close his spread; he will profit by the entire amount of the original credit taken in. In this example, then, the maximum profit potential is 2 points, since that is the amount of the initial credit. This profit would be realized if XYZ were anywhere below 30 at expiration, because both options would expire worthless in that case.

If the spread expands in price, rather than contracts, the bear spreader will be losing money. This expansion would occur in a rising market. The maximum amount that this spread could expand to is 5 points – the difference between the striking prices. Hence, the most that the bear spreader would have to pay to buy back this spread would be 5 points, resulting in a maximum potential loss of 3 points. This loss would be realized if XYZ were anywhere above 35 at October expiration. Table 8-1 and Figure 8-1 depict the actual profit and loss potential of this example at expiration (commissions are not included). The astute reader will note that the figures in the table are exactly the reverse of those shown for the bull spread example in Chapter 7. Also, the profit graph of the bear spread looks like a bull spread profit graph that has been turned upside down. All bear spreads have a profit graph with the same shape at expiration as the graph shown in Figure 8-1.

TABLE 8-1.
Bear spread.

XYZ Price at Expiration	October 30 Profit	October 35 Profit	Total Profit
25	+$300	−$100	+$200
30	+ 300	− 100	+ 200
32	+ 100	− 100	0
35	− 200	− 100	− 300
40	− 700	+ 400	− 300

FIGURE 8-1.
Bear spread.



The break-even point, maximum profit potential, and investment required are all quite simple computations for a bear spread.

Maximum profit potential = Net credit received

Break-even point = Lower striking price + Amount of credit

$$\text{Maximum risk} = \text{Collateral investment required} = \text{Difference in striking prices} - \text{Credit received} + \text{Commissions}$$

In the example above, the net credit received from the sale of the October 30 call at 3 and the purchase of the October 35 call at 1 was two points. This is the maximum profit potential. The break-even point is then easily computed as the lower striking price, 30, plus the amount of the credit, 2, or 32. The risk is equal to the investment. It is the difference between the striking prices – 5 points – less the net credit received – 2 points – for a total investment of 3 points plus commissions. Since this spread involves a call that is not "covered" by a long call with a striking price equal to or lower than that of the short call, some brokerage firms may require a higher maintenance requirement per spread than would be required for a bull spread. Again, since a spread must be done in a margin account, most brokerage firms require that a minimum amount of equity be in the account as well.

Since this is a credit spread, the investor does not really "spend" any dollars to establish the spread. The investment is really a reduction in the buying power of the customer's margin account, but it does not actually require dollars to be spent when the transaction is initiated.

SELECTING A BEAR SPREAD

Depending on where the underlying stock is trading with respect to the two striking prices, the bear spread may be very aggressive, with a high profit potential, or it may be less aggressive, with a low profit potential. If a large credit is initially taken in, there is obviously the potential for a good deal of profit. However, for the spread to take in a large credit, the underlying stock must be well above the lower striking price. This means that a relatively substantial downward move would be necessary in order for the maximum profit potential to be realized. Thus, *a large credit bear spread is usually an aggressive position*; the spreader needs a substantial move by the underlying stock in order to make his maximum profit. The probabilities of this occurring cannot be considered large.

A less aggressive type of bear spread is one in which the underlying stock is actually *below* the lower striking price when the spread is established. The credit received from establishing a bear spread in such a situation would be small, but the spreader would realize his maximum profit even if the underlying stock remained unchanged or actually rose slightly in price by expiration.

Example: XYZ is trading at a price of 25. The October 30 call might be sold for 1½ points and the October 35 call bought for ½ point with the stock at 29. While the net credit, and hence the maximum profit potential, is a small dollar amount, 1 point, it will be realized even if XYZ rises slightly by expiration, as long as it does not rise above 30.

It is not always clear which type of spread is better, the large credit bear spread or the small credit bear spread. One has a small probability of making a large profit and the other has a much larger probability of making a much smaller profit. In general, *bear spreads established when the underlying stock is closer to the lower striking price will be the best ones.* To see this, note that if a bear spread is initiated when the stock is at the higher striking price, the spreader is selling a call that has mostly intrinsic value and little time value premium (since it is in-the-money), and is buying a call that is nearly all time value. This is just the opposite of what the option strategist should be attempting to do. *The basic philosophy of option strategy is to sell time value and buy intrinsic value.* For this reason, the large credit bear spread is not an optimum strategy. It will be interesting to observe later that bear spreads with puts are more attractive when the underlying stock is at the higher striking price!

A bear spread will not collapse right away, even if the underlying stock drops in price. This is somewhat similar to the effect that was observed with the call bull spreads in Chapter 7. They, too, do not accelerate to their maximum profit potential right away. Of course, as time winds down and expiration approaches, *then* the spread

will approach its maximum profit potential. This is important to understand because, if one is expecting a quick move down by the underlying stock, he might need to use a call bear spread in which the lower strike is actually somewhat deeply in-the-money, while the upper strike is out-of-the-money. In this case, the in-the-money call will decline in value as the stock moves down, even if that downward move happens immediately. Meanwhile, the out-of-the-money long call protects against a disastrous upside breakout by the stock. This type of bear spread is really akin to selling a deep in-the-money call for its raw downside profit potential and buying an out-of-the-money call merely as disaster insurance.

FOLLOW-UP ACTION

Follow-up strategies are not difficult, in general, for bear spreads. The major thing that the strategist must be aware of is impending assignment of the short call. If the short side of the spread is in-the-money and has no time premium remaining, the spread should be closed regardless of how much time remains until expiration. This disappearance of time value premium could be caused either by the stock being significantly above the striking price of the stock call, or by an impending dividend payment. In either case, the spread should be closed to avoid assignment and the resultant large commission costs on stock transactions. Note that the large credit bear spread (one established with the stock well above the lower striking price) is dangerous from the viewpoint of early assignment, since the time value premium in the call will be small to begin with.

SUMMARY

The call bear spread is a bearishly oriented strategy. Since the spread is a credit spread, requiring only a reduction in buying power but no actual layout of cash to establish, it is a moderately popular strategy. The bear spread using calls may not be the optimum type of bearish spread that is available; a bear spread using put options may be.

CHAPTER 9

Calendar Spreads

A *calendar spread,* also frequently called a *time spread,* involves the sale of one option and the simultaneous purchase of a more distant option, both with the same striking price. In the broad definition, the calendar spread is a horizontal spread. The neutral philosophy for using calendar spreads is that time will erode the value of the near-term option at a faster rate than it will the far-term option. If this happens, the spread will widen and a profit may result at near-term expiration. With call options, one may construct a more aggressive, bullish calendar spread. Both types of spreads are discussed.

Example: The following prices exist sometime in late January:

	April 50 Call (3-month call)	July 50 Call (6-month call)	October 50 Call (9-month call)
XYZ:50	5	8	10

If one sells the April 50 call and buys the July 50 at the same time, he will pay a debit of 3 points – the difference in the call prices – plus commissions. That is, *his investment is the net debit of the spread plus commissions.* Furthermore, suppose that in 3 months, at April expiration, XYZ is unchanged at 50. Then the 3-month call should be worth 5 points, and the 6-month call should be worth 8 points, as they were previously, all other factors being equal.

	April 50 Call (Expiring)	July 50 Call (3-month call)	October 50 Call (6-month call)
XYZ:50	0	5	8

The spread between the April 50 and the July 50 has now widened to 5 points. Since the spread cost 3 points originally, this widening effect has produced a 2-point profit. The spread could be closed at this time in order to realize the profit, or the spreader may decide to continue to hold the July 50 call that he is long. By continuing to hold the July 50 call, he is risking the profits that have accrued to date, but he could profit handsomely if the underlying stock rises in price over the next 3 months, before July expiration.

It is not necessary for the underlying stock to be exactly at the striking price of the options at near-term expiration for a profit to result. In fact, some profit can be made in a range that extends both below and above the striking price. The risk in this type of position is that the stock will drop a great deal or rise a great deal, in which case the spread between the two options will shrink and the spreader will lose money. Since the spread between two calls at the same strike cannot shrink to less than zero, however, *the risk is limited to the amount of the original debit spent to establish the spread, plus commissions.*

THE NEUTRAL CALENDAR SPREAD

As mentioned earlier, the calendar spreader can either have a neutral outlook on the stock or he can construct the spread for an aggressively bullish outlook. The neutral outlook is described first. The calendar spread that is established when the underlying stock is at or near the striking price of the options used is a neutral spread. The strategist is interested in selling time and not in predicting the direction of the underlying stock. If the stock is relatively unchanged when the near-term option expires, the neutral spread will make a profit. *In a neutral spread, one should initially have the intent of closing the spread by the time the near-term option expires.*

Let us again turn to our example calendar spread described earlier in order to more accurately demonstrate the potential risks and rewards from that spread when the near-term, April, call expires. To do this, it is necessary to estimate the price of the July 50 call at that time. Notice that, with XYZ at 50 at expiration, the results agree with the less detailed example presented earlier. The graph shown in Figure 9-1 is the "total profit" from Table 9-1. The graph is a curved rather than straight line, since the July 50 call still has time premium. There is a slightly bullish bias to this graph: The profit range extends slightly farther above the striking price than it does below the striking price. This is due to the fact that the spread is a call spread. If puts had been used, the profit range would have a bearish bias. The total width of the profit range is a function of the volatility of the underlying stock, since that will determine the price

FIGURE 9-1.
Calendar spread at near-term expiration.

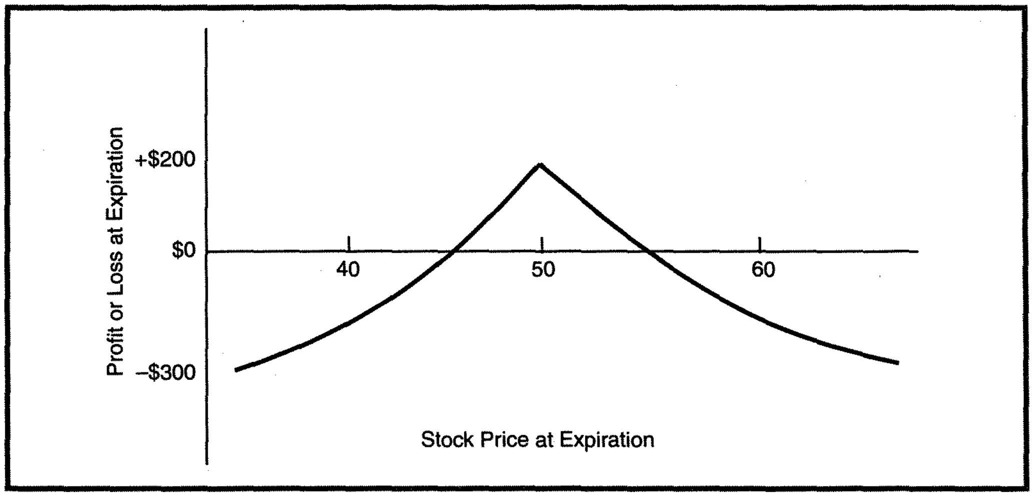


TABLE 9-1.
Estimated profit or losses at April expiration.

XYZ Stock Price	April 50 Price	April 50 Profit	July 50 Price	July 50 Profit	Total Profit
40	0	+$500	½	–$750	–$250
45	0	+ 500	2½	– 550	– 50
48	0	+ 500	4	– 400	+ 100
50	0	+ 500	5	– 300	+ 200
52	2	+ 300	6	– 200	+ 100
55	5	0	8	0	0
60	10	– 500	10½	+ 250	– 250

of the remaining long call at expiration, as well as a function of the time remaining to near-term expiration.

Table 9-1 and Figure 9-1 clearly depict several of the more significant aspects of the calendar spread. *There is a range within which the spread is profitable at near-term expiration.* That range would appear to be about 46 to 55 in the example. Outside that range, losses can occur, but they are limited to the amount of the initial debit. Notice in the example that the stock would have to be well below 40 or well

above 60 for the maximum loss to occur. Even if the stock is at 40 or 60, there is some time premium left in the longer-term option, and the loss is not quite as large as the maximum possible loss of $300.

This type of calendar spread has limited profits and relatively large commission costs. It is generally best to establish such a spread 8 to 12 weeks before the near-term option expires. If this is done, one is capitalizing on the maximum rate of decay of the near-term option with respect to the longer-term option. That is, when a call has less than 8 weeks of life, the rate of decay of its time value premium increases substantially with respect to the longer-term options on the same stock.

THE EFFECT OF VOLATILITY

The implied volatility of the options (and hence the actual volatility of the underlying stock) will have an effect on the calendar spread. *As volatility increases, the spread widens; as volatility contracts, the spread shrinks.* This is important to know. In effect, buying a calendar spread is an *antivolatility* strategy: One wants the underlying to remain somewhat unchanged. Sometimes, calendar spreads look especially attractive when the underlying stock is volatile. However, this can be misleading for two reasons. First of all, since the stock is volatile, there is a greater chance that it will move outside of the profit area. Second, if the stock *does* stabilize and trades in a range near the striking price, the spread will *lose* value because of the decrease in volatility. That loss may be greater than the gain from time decay!

FOLLOW-UP ACTION

Ideally, the spreader would like to have the stock be just below the striking price when the near-term call expires. If this happens, he can close the spread with only one commission cost, that of selling out the long call. If the calls are in-the-money at the expiration date, he will, of course, have to pay two commissions to close the spread. As with all spread positions, the order to close the spread should be placed as a single order. "Legging" out of a spread is highly risky and is not recommended.

Prior to expiration, the spreader should close the spread if the near-term short call is trading at parity. He does this to avoid assignment. Being called out of spread position is devastating from the viewpoint of the stock commissions involved for the public customer. The near-term call would not normally be trading at parity until quite close to the last day of trading, unless the stock has undergone a substantial rise in price.

In the case of an early *downside* breakout by the underlying stock, the spreader has several choices. He could immediately close the spread and take a small loss

on the position. Another choice is to leave the spread alone until the near-term call expires and then to hope for a partial recovery from the stock in order to be able to recover some value from the long side of the spread. Such a holding action is often better than the immediate close-out, because the expense of buying back the short call can be quite large percentagewise. A riskier downside defensive action is to sell out the long call if the stock begins to break down heavily. In this way, the spreader recovers something from the long side of his spread immediately, and then looks for the stock to remain depressed so that the short side of the spread will expire worthless. This action requires that one have enough collateral available to margin the resulting naked call, often an amount substantially in excess of the original debit paid for the spread. Moreover, if the underlying stock should reverse direction and rally back to or above the striking price, the short side of the spread is naked and could produce substantial losses. The risk assumed by such a follow-up violates the initial neutral premise of the spread, and should therefore be avoided. Of these three types of downside defensive action, *the easiest and most conservative one is to do nothing at all*, letting the short call expire worthless and then hoping for a recovery by the underlying stock. If this tack is taken, the risk remains fixed at the original debit paid for the spread, and occasionally a rally may produce large profits on the long call. Although this rally is a nonfrequent event, it generally costs the spreader very little to allow himself the opportunity to take advantage of such a rally if it should occur.

In fact, the strategist can employ a slight modification of this sort of action, even if the spread is not at a large loss. If the underlying stock is moderately below the striking price at near-term expiration, the short option will expire worthless and the spreader will be left holding the long option. He could sell the long side immediately and perhaps take a small gain or loss. However, it is often a reasonable strategy to sell out a portion of the long side – recovering all or a substantial portion of the initial investment – and hold the remainder. If the stock rises, the remaining long position may appreciate substantially. Although this sort of action deviates from the true nature of the time spread, it is not overly risky.

An early breakout to the upside by the underlying stock is generally handled in much the same way as a downside breakout. Doing nothing is often the best course of action. If the underlying stock rallies shortly after the spread is established, the spread will shrink by a small amount, but not substantially, because both options will hold premium in a rally. If the spreader were to rush in to close the position, he would be paying commissions on two rather expensive options. He will usually do better to wait and give himself as much of a chance for a reversal as possible. In fact, even at near-term expiration, there will normally be some time premium left in the long option so that the maximum loss would not have to be realized. A highly risk-oriented upside defensive action is to cover the short call on a technical breakout and

continue to hold the long call. This can become disastrous if the breakout fails and the stock drops, possibly resulting in losses far in excess of the original debit. Therefore, this action cannot be considered anything but extremely aggressive and illogical for the neutral strategist.

If a breakout does not occur, the spreader will normally be making unrealized profits as time passes. Should this be the case, he may want to set some mental stop-out points for himself. For example, if the underlying stock is quite close to the striking price with only two weeks to go, there will be some more profit potential left in the spread, but the spreader should be ready to close the position quickly if the stock begins to get too far away from the striking price. In this manner, he can leave room for more profits to accrue, but he is also attempting to protect the profits that have already built up. This is somewhat similar to the action that the ratio writer takes when he narrows the range of his action points as more and more time passes.

THE BULLISH CALENDAR SPREAD

A less neutral and more bullish type of calendar spread is preferred by the more aggressive investor. In a bullish calendar spread, one sells the near-term call and buys a longer-term call, but *he does this when the underlying stock is some distance below the striking price of the calls.* This type of position has the attractive features of low dollar investment and large potential profits. Of course, there is risk involved as well.

Example: One might set up a bullish calendar spread in the following manner:

XYZ common, 45;
sell the XYZ April 50 for 1; and
buy the XYZ July 50 for $1\frac{1}{2}$.

This investor ideally wants two things to happen. *First, he would like the near-term call to expire worthless.* That is why the bullish calendar spread is established with out-of-the-money calls: to increase the chances of the short call expiring worthless. If this happens, the investor will then own the longer-term call at a net cost of his original debit. In this example, his original debit was only $\frac{1}{2}$ of a point to create the spread. If the April 50 call expires worthless, the investor will own the July 50 call at a net cost of $\frac{1}{2}$ point, plus commissions.

The investor now needs a second criterion to be fulfilled: The stock must rise in price by the time the July 50 call expires. In this example, even if XYZ were to rally to only 52 between April and July, the July 50 call could be sold for at least 2 points. This represents a substantial percentage gain, because the cost of the call has been

reduced to ½ point. Thus, there is the potential for large profits in bullish calendar spreads if the underlying stock rallies above the striking price before the longer-term call expires, provided that the short-term call has already expired worthless.

What chance does the investor have that both ideal conditions will occur? There is a reasonably good chance that the written call will expire worthless, since it is a short-term call and the stock is below the striking price to start with. If the stock falls, or even rises a little – up to, but not above, the striking price – the first condition will have been met. It is the second condition, a rally above the striking price by the underlying stock before the longer-term expiration date, that normally presents the biggest problem. The chances of this happening are usually small, but the rewards can be large when it does happen. Thus, *this strategy offers a small probability of making a large profit.* In fact, one large profit can easily offset several losses, because the losses are small, dollarwise. Even if the stock remains depressed and the July 50 call in the example expires worthless, the loss is limited to the initial debit of ½ point. Of course, this loss represents 100% of the initial investment, so one cannot put all his money into bullish calendar spreads.

This strategy is a reasonable way to speculate, provided that the spreader adheres to the following criteria when establishing the spread:

1. *Select underlying stocks that are volatile enough to move above the striking price within the allotted time.* Bullish calendar spreads may appear to be very "cheap" on nonvolatile stocks that are well below the striking price. But if a large stock move, say 20%, is required in only a few months, the spread is not worthwhile for a nonvolatile stock.
2. *Do not use options more than one striking price above the current market.* For example, if XYZ were 26, use the 30 strike, not the 35 strike, since the chances of a rally to 30 are many times greater than the chances of a rally to 35.
3. *Do not invest a large percentage of available trading capital in bullish calendar spreads.* Since these are such low-cost spreads, one should be able to follow this rule easily and still diversify into several positions.

FOLLOW-UP ACTION

If the underlying stock should rally before the near-term call expires, the bullish calendar spreader must never consider "legging" out of the spread, or consider covering the short call at a loss and attempting to ride the long call. Either action could turn the initial small, limited loss into a disastrous loss. Since the strategy hinges on

the fact that all the losses will be small and the infrequent large profits will be able to overcome these small losses, one should do nothing to jeopardize the strategy and possibly generate a large loss.

The only reasonable sort of follow-up action that the bullish calendar spreader can take in advance of expiration is to close the spread if the underlying stock has moved up in price and the spread has widened to become profitable. This might occur if the stock moves up to the striking price after some time has passed. In the example above, if XYZ moved up to 50 with a month or so of life left in the April 50 call, the call might be selling for 1½ while the July 50 call might be selling for 3 points. Thus, the spread could be closed at 1½ points, representing a 1-point gain over the initial debit of 1/2 point. Two commissions would have to be paid to close the spread, of course, but there would still be a net profit in the spread.

USING ALL THREE EXPIRATION SERIES

In either the neutral calendar spread or the bullish calendar spread, the investor has three choices of which months to use. He could sell the nearest-term call and buy the intermediate-term call. This is usually the most common way to set up these spreads. However, there is no rule that prevents him from selling the intermediate-term and buying the longest-term, or possibly selling the near-term and buying the long-term. Any of these situations would still be calendar spreads.

Some proponents of calendar spreads prefer initially to sell the near-term and buy the long-term call. Then, if the near-term call expires worthless, they have an opportunity to sell the intermediate-term call if they so desire.

Example: An investor establishes a calendar spread by selling the April 50 call and buying the October 50 call. The April call would have less than 3 months remaining and the October call would be the long-term call. At April expiration, if XYZ is below 50, the April call will expire worthless. At that time, the July 50 call could be sold against the October 50 that is held long, thereby creating another calendar spread with no additional commission cost on the long side.

The advantage of this type of strategy is that it is possible for the two sales (April 50 and July 50 in this example) to actually bring in more credits than were spent for the one purchase (October 50). Thus, the spreader might be able to create a position in which he has a guaranteed profit. That is, if the sum of his transactions is actually a credit, he cannot lose money in the spread (provided that he does not attempt to "leg" out of the spread). The disadvantage of using the long-term call in the calendar spread is that the initial debit is larger, and therefore more dollars are initially at risk.

If the underlying stock moves substantially up or down in the first 3 months, the spreader could realize a larger dollar loss with the October/April spread because his loss will approach the initial debit.

The remaining combination of the expiration series is to initially buy the longest-term call and sell the intermediate-term call against it. This combination will generally require the smallest initial debit, but there is not much profit potential in the spread until the intermediate-term expiration date draws near. Thus, there is a lot of time for the underlying stock to move some distance away from the initial striking price. For this reason, this is generally an inferior approach to calendar spreading.

SUMMARY

Calendar spreading is a low-dollar-cost strategy that is a nonaggressive approach, provided that the spreader does not invest a large percentage of his trading capital in the strategy, and provided that he does not attempt to "leg" into or out of the spreads. The neutral calendar spread is one in which the strategist is mainly selling time; he is attempting to capitalize on the known fact that the near-term call will lose time premium more rapidly than will a longer-term call. A more aggressive approach is the bullish calendar spread, in which the speculator is essentially trying to reduce the net cost of a longer-term call by the amount of credits taken in from the sale of a nearer-term call. This bullish strategy requires that the near-term call expire worthless and then that the underlying stock rise in price. In either strategy, the most common approach is to sell the nearest-term call and buy the intermediate-term call. However, it may sometimes prove advantageous to sell the near-term and buy the longest-term initially, with the intention of letting the near-term expire and then possibly writing against the longer-term call a second time.

CHAPTER 10

The Butterfly Spread

The recipient of one of the more exotic names given to spread positions, *the butterfly spread is a neutral position that is a combination of both a bull spread and a bear spread.* This spread is for the neutral strategist, one who thinks the underlying stock will not experience much of a net rise or decline by expiration. It generally requires only a small investment and has limited risk. Although profits are limited as well, they are larger than the potential risk. For this reason, the butterfly spread is a viable strategy. However, it is costly in terms of commissions. In this chapter, the strategy is explained using only calls. The strategy can also be implemented using a combination of puts and calls, or with puts only, as will be demonstrated later.

There are three striking prices involved in a butterfly spread. Using only calls, the butterfly spread consists of buying one call at the lowest striking price, selling two calls at the middle striking price, and buying one call at the highest striking price. The following example will demonstrate how the butterfly spread works.

Example: A butterfly spread is established by buying a July 50 call for 12, selling 2 July 60 calls for 6 each, and buying a July 70 call for 3. The spread requires a relatively low debit of $300 (Table 10-1), although there are four option commissions involved and these may represent a substantial percentage of the net investment. As usual, *the maximum amount of profit is realized at the striking price of the written calls.* With most types of spreads, this is a useful fact to remember, for it can aid in quick computation of the potential of the spread. In this example, if the stock were at the striking price of the written options at expiration (60), the two July 60's that are short would expire worthless for a $1,200 gain. The long July 70 call would expire worthless for a $300 loss, and the long July 50 call would be worth 10 points, for a $200 loss on that call. The sum of the gains and losses would thus be a $700 gain, less commissions. This is the maximum profit potential of the spread.

TABLE 10-1.
Butterfly spread example.

Current prices:	
XYZ common:	60
XYZ July 50 call:	12
XYZ July 60 call:	6
XYZ July 70 call:	3
Butterfly spread:	
Buy 1 July 50 call	$1,200 debit
Sell 2 July 60 calls	$1,200 credit
Buy 1 July 70 call	$300 debit
Net debit	$300 (plus commissions)

The risk is limited in a butterfly spread, both to the upside and to the downside, and is equal to the amount of the net debit required to establish the spread. In the example above, the risk is limited to $300 plus commissions.

Table 10-2 and Figure 10-1 depict the results of this butterfly spread at various prices at expiration. The profit graph resembles that of a ratio write, except that the loss is limited on both the upside and the downside. There is a profit range within which the butterfly spread makes money – 53 to 67 in the example, before commissions are included. Outside this profit range, losses will occur at expiration, but these losses are limited to the amount of the original debit plus commissions.

In accordance with more lenient margin requirements passed in 2000, the investment required for a butterfly spread is equal to the net debit expended, which is the risk in the spread. When the options expire in the same month and the striking prices are evenly spaced (the spacing is 10 points in this example), the following formulae can be used to quickly compute the important details of the butterfly spread:

Net investment = Net debit of the spread
Maximum profit = Distance between strikes – Net debit
Downside break-even = Lowest strike + Net debit
Upside break-even = Highest strike – Net debit

In the example, the distance between strikes is 10 points, the net debit is 3 points (before commissions), the lowest strike used is 50, and the highest strike is 70. These formulae would then yield the following results for this example spread.

Net investment = 3 points = $300

Maximum profit =10 – 3 = $700

Downside break-even = 50 + 3 = 53

Upside break-even = 70 – 3 = 67

FIGURE 10-1.
Butterfly spread.

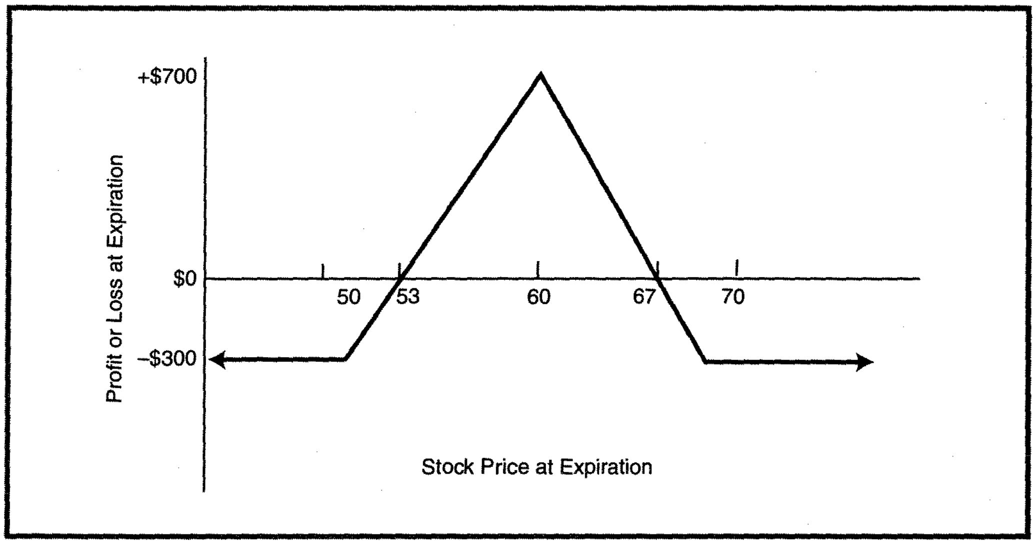


TABLE 10-2.
Results of butterfly spread at expiration.

XYZ Price at Expiration	July 50 Profit	July 60 Profit	July 70 Profit	Total Profit
40	–$1,200	+$1,200	–$300	–$300
50	– 1,200	+ 1,200	– 300	– 300
53	– 900	+ 1,200	– 300	0
56	– 600	+ 1,200	– 300	+ 300
60	– 200	+ 1,200	– 300	+ 700
64	+ 200	+ 400	– 300	+ 300
67	+ 500	– 200	– 300	0
70	+ 800	– 800	– 300	– 300
80	+ 1,800	– 2,800	+ 700	– 300

Note that all of these answers agree with the results that were previously obtained by analyzing the example spread in detail.

In this example, the maximum profit potential is $700, the maximum risk is $300, and the investment required is also $300, commissions excluded. In percentage terms, this means that the butterfly spread has a loss limited to about 100% of capital invested and could make profits of nearly 133% in this case. These represent an attractive risk/reward relationship. This is, however, just an example, and two factors that exist in the actual marketplace may greatly affect these numbers. First, commissions are large; it is possible that eight commissions might have to be paid to establish and liquidate the spread. Second, depending on the level of premiums to be found in the market at any point in time, it may not be possible to establish a spread for a debit as low as 3 points when the strikes are 10 points apart.

SELECTING THE SPREAD

Ideally, one would want to establish a butterfly spread at as small of a debit as possible in order to limit his risk to a small amount, although that risk is still equal to 100% of the dollars invested in the spread. One would also like to have the stock be near the middle striking price to begin with, because he will then be in his maximum profit area if the stock remains relatively unchanged. Unfortunately, it is difficult to satisfy both conditions simultaneously.

The smallest-debit butterfly spreads are those in which the stock is some distance away from the middle striking price. To see this, note that if the stock were well above the middle strike and all the options were at parity, the net debit would be zero. Although no one would attempt to establish a butterfly spread with parity options because of the risk of early assignment, it may be somewhat useful to try to obtain a small debit by taking an opinion on the underlying stock. For example, if the stock is close to the higher striking price, the debit would be small normally, but the investor would have to be somewhat bearish on the underlying stock in order to maximize his profit; that is, the stock would have to decline in price from the upper striking price to the middle striking price for the maximum profit to be realized. An analogous situation exists when the underlying stock is originally close to the lower striking price. The investor could establish the spread for a small debit in this case also, but he would now have to be somewhat bullish on the underlying stock in order to attempt to realize his maximum profit.

Example: XYZ is at 70. One may be able to establish a low-debit butterfly spread with the 50's, 60's, and 70's if the following prices exist:

XYZ common, 70;
XYZ July 50, 20;
XYZ July 60, 12; and
XYZ July 70, 5.

The butterfly spread would require a debit of only $100 plus commissions to establish, because the cost of the calls at the higher and lower strike is 25 points, and a 24-point credit would be obtained by selling two calls at the middle strike. This is indeed a low-cost butterfly spread, but the stock will have to move down in price for much of a profit to be realized. The maximum profit of $900 less commissions would be realized at 60 at expiration. The strategist would have to be bearish on XYZ to want to establish such a spread.

Without the aid of an example, the reader should be able to determine that if XYZ were originally at 50, a low-cost butterfly spread could be established by buying the 50, selling two 60's, and buying a 70. In this case, however, the investor would have to be bullish on the stock, because he would want it to move up to 60 by expiration in order for the maximum profit to be realized.

In general, then, if the butterfly spread is to be established at an extremely low debit, the spreader will have to make a decision as to whether he wants to be bullish or bearish on the underlying stock. Many strategists prefer to remain as neutral as possible on the underlying stock at all times in any strategy. This philosophy would lead to slightly higher debits, such as the $300 debit in the example at the beginning of this chapter, but would theoretically have a better chance of making money because there would be a profit if the stock remained relatively unchanged, the most probable occurrence.

In either philosophy, there are other considerations for the butterfly spread. *The best butterfly spreads are generally found on the more expensive and/or more volatile stocks that have striking prices spaced 10 or 20 points apart.* In these situations, the maximum profit is large enough to overcome the weight of the commission costs involved in the butterfly spread. When one establishes butterfly spreads on lower-priced stocks whose striking prices are only 5 points apart, he is normally putting himself at a disadvantage unless the debit is extremely small. One exception to this rule is that attractive situations are often found on higher-priced stocks with striking prices 5 points apart (50, 55, and 60, for example). They do exist from time to time.

In analyzing butterfly spreads, one commonly works with closing prices. It was mentioned earlier that using closing prices for analysis can prove somewhat misleading, since the actual execution will have to be done at bid and asked prices, and these

may differ somewhat from closing prices. Normally, this difference is small, but since there are three different calls involved in a butterfly spread, the difference could be substantial. Therefore, it is usually necessary to check the appropriate bid and asked price for each call before entering the spread, in order to be able to place a reasonable debit on the order. As with other types of spreads, the butterfly spread order can be placed as one order.

Before moving on to discuss follow-up action, it may be worthwhile to describe a tactic for stocks with 5 points between striking prices. For example, the butterfly spreader might work with strikes of 45, 50, and 60. If he sets up the usual type of butterfly spread, he would end up with a position that has too much risk near 60 and very little or none at all near 45. If this is what he wants, fine; but if he wants to remain neutral, the standard type of butterfly spread will have to be modified slightly.

Example: The following prices exist:

XYZ common, 50;
July 45 call, 7;
July 50 call, 5; and
July 60 call, 2.

The normal type of butterfly spread – buying one 45, selling two 50's, and buying one 60 – can actually be done for a credit of 1 point. However, the profitability is no longer symmetric about the middle striking price. In this example, the investor cannot lose to the downside because, even if the stock collapses and all the calls expire worthless, he will still make his 1-point credit. However, to the upside, there is risk: If XYZ is anywhere above 60 at expiration, the risk is 4 points. This is no longer a neutral position. The fact that the lower strike is only 5 points from the middle strike while the higher strike is 10 points away has made this a somewhat bearish position. If the spreader wants to be neutral and still use these striking prices, he will have to put on two bull spreads and only one bear spread. That is, he should:

Buy 2 July 45's:	$1,400 debit
Sell 3 July 50's:	$1,500 credit
Buy 1 July 60:	$200 debit

This position now has a net debit of $100 but has a better balance of risk at either end. If XYZ drops and is below 45 at expiration, the spreader will lose his $100 initial debit. But now, if XYZ is at or above 60 at expiration, he will lose $100 in that range also. Thus, by establishing two bull spreads with a 5-point difference between

strikes versus one bear spread with a 10-point difference between strikes, the risk has been balanced at both ends. When one uses strike prices that are *not* evenly spaced apart, his margin requirement increases substantially. In such a case, one has to margin the individual component spreads separately. Therefore, in this example, he would have to pay for the two bull spreads ($200 each, for a total of $400) and then margin the additional call bear spread ($700: the $1,000 difference in the strikes, less the $300 credit taken in for that portion of the spread). Hence, in this example, the margin requirement would be $1,100, even though the risk is only $100. Technically, of that $1,100 requirement, the spread trader pays out only $100 in cash (the actual debit of the spread), and the rest of the requirement can be satisfied with excess equity in his account.

The same analysis obviously applies whenever 5-point striking price intervals exist. There are numerous combinations that could be worked out for lower-priced stocks by merely skipping over a striking price (using the 25's, 30's, and 40's, for example). Although there are not normally many stocks trading over $100 per share, the same analysis is applicable using 130's, 140's, and 160's, for example.

FOLLOW-UP ACTION

Since the butterfly spread has limited risk by its construction, there is usually little that the spreader has to do in the way of follow-up action other than avoiding early exercise or possibly closing out the position early to take profits or limit losses even further. The only part of the spread that is subject to assignment is the call at the middle strike. If this call trades at or near parity, in-the-money, the spread should be closed. This may happen before expiration if the underlying stock is about to go ex-dividend. It should be noted that accepting assignment will not increase the risk of the spread (because any short calls assigned would still be protected by the remaining long calls). However, the margin requirement would change substantially, since one would now have a synthetic put (long calls, short stock) in place. Plus, there may be more onerous commissions for trading stock. Therefore, it is usually wise to avoid assignment in a butterfly spread, or in any spread, for that matter.

If the stock is near the middle strike after a reasonable amount of time has passed, an unrealized profit will begin to accrue to the spreader. If one feels that the underlying stock is about to move away from the middle striking price and thereby jeopardize these profits, it may be advantageous to close the spread to take the available profit. Be certain to include commission costs when determining if an unrealized profit exists. As a general rule of thumb, if one is doing 10 spreads at a time, he

can estimate that the commission cost for each option is about 1/8 point. That is, if one has 10 butterfly spreads and the spread is currently at 6 points, he could figure that he would net about 5 1/2 points after commissions to close the spread. This 1/8 estimate is only valid if the spreader has at least 10 options at each strike involved in a spread.

Normally, one would not close the spread early to limit losses, since these losses are limited to the original net debit in any case. However, if the original debit was large and the stock is beginning to break out above the higher strike or to break down below the lower strike, the spreader may want to close the spread to limit losses even further.

It has been repeatedly stated that one should not attempt to "leg" out of a spread because of the risk that is incurred if one is wrong. However, there is a method of legging out of a butterfly spread that is acceptable and may even be prudent. Since the spread consists of both a bull spread and a bear spread, it may often be the case that the stock experiences a relatively substantial move in one direction or the other during the life of the butterfly spread, and that the bull spread portion or the bear spread portion could be closed out near their maximum profit potentials. If this situation arises, the spreader may want to take advantage of it in order to be able to profit more if the underlying stock reverses direction and comes back into the profit range.

Example: This strategy can be explained by using the initial example from this chapter and then assuming that the stock falls from 60 to 45. Recall that this spread was initially established with a 3-point debit and a maximum profit potential of 7 points. The profit range was 53 to 67 at July expiration. However, a rather unpleasant situation has occurred: The stock has fallen quickly and is below the profit range. If the spreader does nothing and keeps the spread on, he will lose 3 points at most if the stock remains below 50 until July expiration. However, by increasing his risk slightly, he may be able to improve his position. Notice in Table 10-3 that the bear spread portion of the overall spread – short July 60, long July 70 – has very nearly reached its maximum potential. The bear spread could be bought back for 1/2 point total (pay 1 point to buy back the July 60 and receive 1/2 point from selling out the July 70). Thus, the spreader could convert the butterfly spread to a bull spread by spending 1/2 point. What would such an action do to his overall position? First, his risk would be increased by the 1/2 point spent to close the bear spread. That is, if XYZ continues to remain below 50 until July expiration, he would now lose 3 1/2 rather than 3 points, plus commissions in either case. He has, however, potentially helped his chances of realizing something close to the maximum profit available from the original butterfly spread.

TABLE 10-3.
Initial spread and current prices.

Initial Spread		Current Prices	
XYZ common:	60	XYZ common:	45
July 50 call:	12	July 50 call:	2
July 60 call:	6	July 60 call:	1
July 70 call:	3	July 70 call:	1/2

After buying back the bear spread, he is left with the following bull spread:

Long July 50 call
Short July 60 call – Net debit 3½ points

He has a bull spread at the total cost paid to date – 3½ points. From the earlier discussion of bull spreads, the reader should know that the break-even point for this position is 53½ at expiration, and it could make a 6½ point profit if XYZ is anywhere over 60 at July expiration. Hence, the break-even point for the position was raised from 53 to 53½ by the expense of the ½ point to buy back the bear spread. However, if the stock should rally back above 60, the strategist will be making a profit nearly equal to the original maximum profit that he was aiming for (7 points). Moreover, this profit is now available anywhere over 60, not just exactly at 60 as it was in the original position. Although the chances of such a rally cannot be considered great, it does not cost the spreader much to restructure himself into a position with a much broader maximum profit area.

A similar situation is available if the underlying stock moves up in price. In that case, the bull spread may be able to be removed at nearly its maximum profit potential, thereby leaving a bear spread. Again, suppose that the same initial spread was established but that XYZ has risen to 75. When the underlying stock advances substantially, the bull spread portion of the butterfly spread may expand to near its maximum potential. Since the strikes are 10 points apart in this bull spread, the widest it can grow to is 10 points. At the prices shown in Table 10-4, the bull spread – long July 50 and short July 60 – has grown to 9½ points. Thus, the bull spread position could be removed within ½ point of its maximum profit potential and the original butterfly spread would become a bear spread. Note that the closing of the bull spread portion generates a 9½ point credit: The July 50 is sold at 25½ and the July 60 is bought back at 16. The original butterfly spread was established at a 3-point debit, so the net position is the remaining position:

Long July 70 call
Short July 60 call – Net credit 6½ points

This bear spread has a maximum profit potential of 6½ points anywhere below 60 at July expiration. The maximum risk is 3½ points anywhere above 70 at expiration. Thus, the original butterfly spread was again converted into a position such that a stock price reversal to any price below 60 could produce something close to the maximum profit. Moreover, the risk was only increased by an additional ½ point.

TABLE 10-4.
Initial spread and new current prices.

Initial Spread		Current Prices	
XYZ common:	60	XYZ common:	75
XYZ July 50 call:	12	July 50 call:	25½
July 60 call:	6	July 60 call:	16
July 70 call:	3	July 70 call:	7

SUMMARY

The butterfly spread is a viable, low-cost strategy with both limited profit potential and limited risk. It is actually a combination of a bull spread and a bear spread, and involves using three striking prices. The risk is limited should the underlying stock fall below the lowest strike or rise above the highest strike. The maximum profit is obtained at the middle strike. One can keep his initial debits to a minimum by initially assuming a bullish or bearish posture on the underlying stock. If he would rather remain neutral, he will normally have to pay a slightly larger debit to establish the spread, but may have a better chance of making money. If the underlying stock experiences a large move in one direction or the other prior to expiration, the spreader may want to close the profitable side of his butterfly spread near its maximum profit potential in order to be able to capitalize on a stock price reversal, should one occur.

CHAPTER 11

Ratio Call Spreads

A *ratio call spread* is a neutral strategy in which one buys a number of calls at a lower strike and sells more calls at a higher strike. It is somewhat similar to a ratio write in concept, although the spread has less downside risk and normally requires a smaller investment than does a ratio write. The ratio spread and ratio write are similar in that both involve uncovered calls, and both have profit ranges within which a profit can be made at expiration. Other comparisons are demonstrated throughout the chapter.

Example: The following prices exist:

XYZ common, 44;
XYZ April 40 call, 5; and
XYZ April 45 call, 3.

A 2:1 ratio call spread could be established by buying one April 40 call and simultaneously selling two April 45's. This spread would be done for a credit of 1 point – the sale of the two April 45's bringing in 6 points and the purchase of the April 40 costing 5 points. This spread can be entered as one spread order, specifying the net credit or debit for the position. In this case, the spread would be entered at a net credit of 1 point.

Ratio spreads, unlike ratio writes, have a relatively small, limited downside risk. In fact, if the spread is established at an initial credit, there is no downside risk at all. In a ratio spread, *the profit or loss at expiration is constant below the lower striking price,* because both options would be worthless in that area. In the example above, if XYZ is below 40 at April expiration, all the options would expire worthless and the spreader would have made a profit of his initial 1-point credit, less commissions. This 1-point gain would occur anywhere below 40 at expiration; it is a constant.

The maximum profit at expiration for a ratio spread occurs if the stock is exactly at the striking price of the written options. This is true for nearly all types of strategies involving written options. In the example, if XYZ were at 45 at April expiration, the April 45 calls would expire worthless for a gain of $600 on the two of them, and the April 40 call would be worth 5 points, resulting in no gain or loss on that call. Thus, the total profit would be $600 less commissions.

The greatest risk in a ratio call spread lies to the upside, where the loss may theoretically be unlimited. The upside break-even point in this example is 51, as shown in Table 11-1. The table and Figure 11-1 illustrate the statements made in the preceding paragraphs.

In a 2:1 ratio spread, two calls are sold for each one purchased. The maximum profit amount and the upside break-even point can easily be computed by using the following formulae:

Points of maximum profit = Initial credit + Difference between strikes *or*

= Difference between strikes – Initial debit

Upside break-even point = Higher strike price + Points of maximum profit

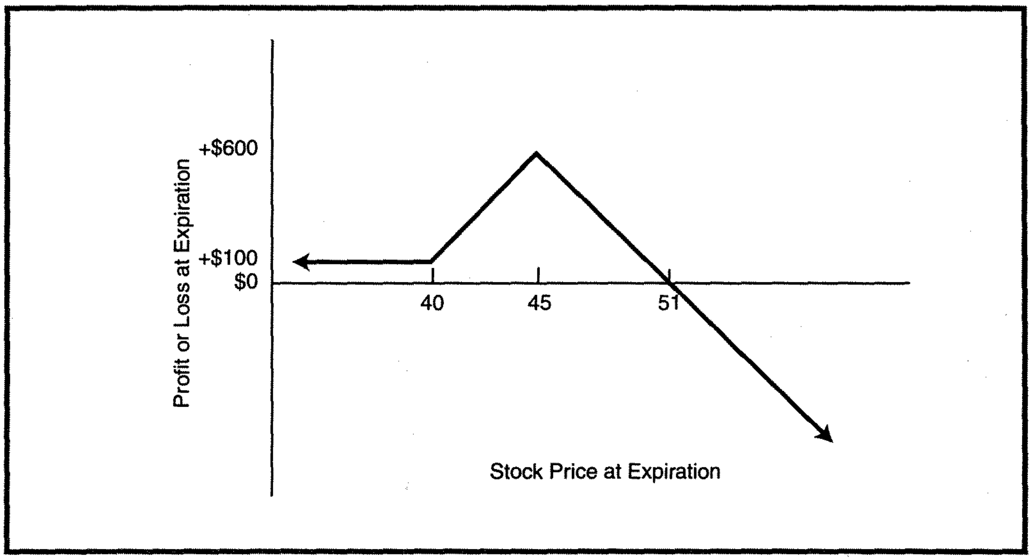
In the preceding example, the initial credit was 1 point, so the points of maximum profit = 1 + 5 = 6, or $600. The upside break-even point is then 45 + 6, or 51. This agrees with the results determined earlier. Note that if the spread is established at a debit rather than a credit, the debit is subtracted from the striking price differential to determine the points of maximum profit.

Many neutral investors prefer ratio spreads over ratio writes for two reasons:

TABLE 11-1.
Ratio call spread.

XYZ Price at Expiration	April 40 Call Profits	April 45 Call Profits	Total Profits
35	–$ 500	+$ 600	+$100
40	– 500	+ 600	+ 100
42	– 300	+ 600	+ 300
45	0	+ 600	+ 600
48	+ 300	0	+ 300
51	+ 600	– 600	0
55	+1,000	–1,400	– 400
60	+1,500	–2,400	– 900

FIGURE 11-1.
Ratio call spread (2:1).



1. The downside risk or gain is predetermined in the ratio spread at expiration, and therefore the position does not require much monitoring on the downside.
2. The margin investment required for a ratio spread is normally smaller than that required for a ratio write, since on the long side one is buying a call rather than buying the common stock itself.

For margin purposes, a ratio spread is really the combination of a bull spread and a naked call write. There is no margin requirement for a bull spread other than the net debit to establish the bull spread. The net investment for the ratio spread is thus equal to the collateral required for the naked calls in the spread plus or minus the net debit or credit of the spread. In the example above, there is one naked call. The requirement for the naked call is 20% of the stock price plus the call premium, less the out-of-the-money amount. So the requirement in the example would be 20% of 44, or $880, plus the call premium of $300, less the one point that the stock is below the striking price – a $1,080 requirement for the naked call. Since the spread was established at a credit of one point, this credit can also be applied against the initial requirement, thereby reducing that requirement to $980. Since there is a naked call in this spread, there will be a mark to market if the stock moves up. Just as was recommended for the ratio write, *it is recommended that the ratio spreader allow at least enough collateral to reach the upside break-even point.* Since the upside break-even point is 51 in this example, the spreader should allow 20% of 51, or $1,020, plus

the 6 points that the call would be worth less the 1-point initial net credit – a total of \$1,520 for this spread (\$1,020 + \$600 – \$100).

DIFFERING PHILOSOPHIES

For many strategies, there is more than one philosophy of how to implement the strategy. Ratio spreads are no exception, with three philosophies being predominant. One philosophy holds that ratio spreading is quite similar to ratio writing – that one should be looking for opportunities to purchase an in-the-money call with little or no time premium in it so that the ratio spread simulates the profit opportunities from the ratio write as closely as possible with a smaller investment. The ratio spreads established under this philosophy may have rather large debits if the purchased call is substantially in-the-money. Another philosophy of ratio spreading is that spreads should be established for credits so that there is no chance of losing money on the downside. Both philosophies have merit and both are described. A third philosophy, called the "delta spread," is more concerned with neutrality, regardless of the initial debit or credit. It is also described.

RATIO SPREAD AS RATIO WRITE

There are several spread strategies similar to strategies that involve common stock. In this case, the ratio spread is similar to the ratio write. Whenever such a similarity exists, it may be possible for the strategist to buy an in-the-money call with little or no time premium as a substitute for buying the common stock. This was seen earlier in the covered call writing strategy, where it was shown that the purchase of in-the-money calls or warrants might be a viable substitute for the purchase of stock. *If one is able to buy an in-the-money call as a substitute for the stock, he will not affect his profit potential substantially.* When comparing a ratio spread to a ratio write, the maximum profit potential and the profit range are reduced by the time value premium paid for the long call. If this call is at parity (the time value premium is thus zero), the ratio spread and the ratio write have exactly the same profit potential. Moreover, the net investment is reduced and there is less downside risk should the stock fall in price below the striking price of the purchased call. The spread also involves smaller commission costs than does the ratio write, which involves a stock purchase. The ratio writer does receive stock dividends, if any are paid, whereas the spreader does not.

Example: XYZ is at 50, and an XYZ July 40 call is selling for 11 while an XYZ July 50 call is selling for 5. Table 11-2 compares the important points between the ratio write and the ratio spread.

TABLE 11-2.
Ratio write and ratio spread compared.

	Ratio Write: Buy XYZ at 50 and Sell 2 July 50's at 5	Ratio Spread: Buy 1 July 40 at 11 and Sell 2 July 50's at 5
Profit range	40 to 60	41 to 59
Maximum profit	10 points	9 points
Downside risk	40 points	1 point
Upside risk	40 points	Unlimited
Initial investment	$3,000	$1,600

In Chapter 6, it was pointed out that ratio writing was one of the better strategies from a probability of profit viewpoint. That is, the profit potential conforms well to the expected movement of the underlying stock. The same statement holds true for ratio spreads as substitutes for ratio writes. In fact, the ratio spread may often be a better position than the ratio write itself, when the long call can be purchased with little or no time value premium in it.

RATIO SPREAD FOR CREDITS

The second philosophy of ratio spreads is to establish them only for credits. Strategists who follow this philosophy generally want a second criterion fulfilled also: that the underlying stock be below the striking price of the written calls when the spread is established. In fact, the farther the stock is below the strike, the more attractive the spread would be. This type of ratio spread has no downside risk because, even if the stock collapses, the spreader will still make a profit equal to the initial credit received. This application of the ratio spread strategy is actually a subcase of the application discussed above. That is, it may be possible both to buy a long call for little or no time premium, thereby simulating a ratio write, and also to be able to set up the position for a credit.

Since the underlying stock is generally below the maximum profit point when one establishes a ratio spread for a credit, *this is actually a mildly bullish position.* The investor would want the stock to move up slightly in order for his maximum profit potential to be realized. Of course, the position does have unlimited upside risk, so it is not an overly bullish strategy.

These two philosophies are not mutually exclusive. The strategist who uses ratio spreads without regard for whether they are debit or credit spreads will generally have a broader array of spreads to choose from and will also be able to assume a more neutral posture on the stock. The spreader who insists on generating credits only will be forced to establish spreads on which his return will be slightly smaller if the underlying stock remains relatively unchanged. However, he will not have to worry about downside defensive action, since he has no risk to the downside. The third philosophy, the "delta spread," is described after the next section, in which the uses of ratios other than 2:1 are described.

ALTERING THE RATIO

Under either of the two philosophies discussed above, the strategist may find that a 3:1 ratio or a 3:2 ratio better suits his purposes than the 2:1 ratio. It is not common to write in a ratio of greater than 4:1 because of the large increase in upside risk at such high ratios. The higher the ratio that is used, the higher will be the credits of the spread. This means that the profits to the downside will be greater if the stock collapses. The lower the ratio that is used, the higher the upside break-even point will be, thereby reducing upside risk.

Example: If the same prices are used as in the initial example in this chapter, it will be possible to demonstrate these facts using three different ratios (Table 11-3):

XYZ common, 44;
XYZ April 40 call, 5; and
XYZ April 45 call, 3.

TABLE 11-3.
Comparison of three ratios.

	3:2 Ratio: Buy 2 April 40's Sell 3 April 45's	2:1 Ratio: By 1 April 40 Sell 2 April 45's	3:1 Ratio: Buy 1 April 40 Sell 3 April 45's
Price of spread (downside risk)	1 debit	1 credit	4 credit
Upside break-even	54	51	49½
Downside break-even	40½	None	None
Maximum profit	9	6	9

In Chapter 6 on ratio writing, it was seen that it was possible to alter the ratio to adjust the position to one's outlook for the underlying stock. The altering of the ratio in a ratio spread accomplishes the same objective. In fact, as will be pointed out later in the chapter, the ratio may be adjusted continuously to achieve what is considered to be a "neutral spread." A similar tactic, using the option's delta, was described for ratio writes.

The following formulae allow one to determine the maximum profit potential and upside break-even point for any ratio:

$$\text{Points of maximum profit} = \text{Net credit} + \text{Number of long calls} \times \text{Difference in striking prices } \textit{or}$$

$$= \text{Number of long calls} \times \text{Difference in striking prices} - \text{Net debit}$$

$$\text{Upside break-even point} = \frac{\text{Points of maximum profit}}{\text{Number of naked calls}} + \text{Higher striking price}$$

These formulae can easily be verified by checking the numbers in Table 11-3.

THE "DELTA SPREAD"

The third philosophy of ratio spreading is a more sophisticated approach that is often referred to as the *delta spread,* because the deltas of the options are used to establish and monitor the spread. Recall that the delta of a call option is the amount by which the option is expected to increase in price if the underlying stock should rise by one point. *Delta spreads are neutral spreads* in that one uses the deltas of the two calls to set up a position that is initially neutral.

Example: The deltas of the two calls that appeared in the previous examples were .80 and .50 for the April 40 and April 45, respectively. If one were to buy 5 of the April 40's and simultaneously sell 8 of the April 45's, he would have a delta-neutral spread. That is, if XYZ moved up by one point, the 5 April 40 calls would appreciate by .80 point each, for a net gain of 4 points. Similarly, the 8 April 45 calls that he is short would each appreciate by .50 point for a net loss of 4 points on the short side. Thus, the spread is initially neutral – the long side and the short side will offset each other. *The idea of setting up this type of neutral spread is to be able to capture the time value premium decay in the preponderance of short calls without subjecting the spread to an inordinate amount of market risk.* The actual credit or debit of the spread is not a determining factor.

It is a fairly simple matter to determine the correct ratio to use in the delta spread: Merely *divide the delta of the purchased call by the delta of the written call.* In the example, this implies that the neutral ratio is .80 divided by .50, or 1.6:1. Obviously, one cannot sell 1.6 calls, so it is common practice to express that ratio as 16:10. Thus, the neutral spread would consist of buying 10 April 40's and selling 16 April 45's. This is the same as an 8:5 ratio. Notice that this calculation does not include anything about debits or credits involved in the spread. In this example, an 8:5 ratio would involve a small debit of one point (5 April 40's cost 25 points and 8 April 45's bring in 24 points). Generally, reasonably selected delta spreads involve small debits.

Certain selection criteria can be offered to help the spreader eliminate some of the myriad possibilities of delta spreads on a day-to-day basis. First, one does not want the ratio of the spread to be too large. An absolute limit, such as 4:1, can be placed on all spread candidates. Also, if one eliminates any options selling for less than ½ point as candidates for the short side of the spread, the higher ratios will be eliminated. Second, one does not want the ratio to be too small. If the delta-neutral ratio is less than 1.2:1 (6:5), the spread should probably be rejected. Finally, if one is concerned with downside risk, he might want to limit the total debit outlay. This might be done with a simple parameter, such as not paying a debit of more than 1 point per long option. Thus, in a spread involving 10 long calls, the total debit must be 10 points or less. These screens are easily applied, especially with the aid of a computer analysis. One merely uses the deltas to determine the neutral ratio. Then, if it is too small or too large, or if it requires the outlay of too large a debit, the spread is rejected from consideration. If not, it is a potential candidate for investment.

FOLLOW-UP ACTION

Depending on the initial credit or debit of the spread, it may not be necessary to take any downside defensive action at all. *If the initial debit was large, the writer may roll down the written calls as in a ratio write.*

Example: An investor has established the ratio write by buying an XYZ July 40 call and selling two July 60 calls with the stock near 60. He might have done this because the July 40 was selling at parity. If the underlying stock declines, this spreader could roll down to the 50's and then to the 45's, in the same manner as he would with a ratio write. *On the other hand, if the spread was initially set up with contiguous striking prices, the lower strike being just below the higher strike, no rolling-down action would be necessary.*

REDUCING THE RATIO

Upside follow-up action does not normally consist of rolling up as it does in a ratio write. Rather, *one should usually buy some more long calls to reduce the ratio in the spread.* Eventually, he would want to reduce the spread to 1:1, or a normal bull spread. An example may help to illustrate this concept.

Example: In the initial example, one April 40 call was bought and two April 45's were sold, for a net credit of one point. Assume that the spreader is going to buy one more April 40 as a means of upside defensive action if he has to. When and if he buys this second long call, his total position will be a normal bull spread – long 2 April 40's and short 2 April 45's. The liquidating value of this bull spread would be 10 points if XYZ were above 45 at April expiration, since each of the two bull spreads would widen to its maximum potential (5 points) with the stock above 45 in April. The ratio spreader originally brought in a one-point credit for the 2:1 spread. If he were later to pay 11 points to buy the additional long April 40 call, his total outlay would have been 10 points. This would represent a break-even situation at April expiration if XYZ were above 45 at that time, since it was just shown that the spread could be liquidated for 10 points in that case. So the ratio spreader could wait to take defensive action until the April call was selling for 11 points. This is a dynamic type of follow-up action, one that is dependent on the options' price, not the stock price per se.

This outlay of 11 points for the April 40 would leave a break-even situation as long as the stock did not reverse and fall in price below 45 after the call was bought. The spreader may decide that he would rather leave some room for upside profit rather than merely trying to break even if the stock rallies too far. He might thus decide to buy the additional long call at 9 or 10 points rather than waiting for it to get to 11. Of course, this might increase the chances of a whipsaw occurring, but it would leave some room for upside profits if the stock continues to rise.

Where ratios other than 2:1 are involved initially, the same thinking can be applied. In fact, the purchase of the additional long calls might take place in a two-step process.

Example: If the spread was initially long 5 calls and short 10 calls, the spreader would not necessarily have to wait until the April 40's were selling at 11 and then buy all 5 needed to make the spread a normal bull spread. He might decide to buy 2 or 3 at a lower price, thereby reducing his ratio somewhat. Then, if the stock rallied even further, he could buy the needed long calls. By buying a few at a cheaper price, the spreader gives himself the leeway to wait considerably longer to the upside. In essence, all 5 additional long calls in this spread would have to be bought at an average price of 11 or lower in order for the spread to break even. However, if the first 2

of them are bought for 8 points, the spreader would not have to buy the remaining 3 until they were selling around 13. Thus, he could wait longer to the upside before reducing the spread ratio to 1:1 (a bull spread). A formula can be applied to determine the price one would have to pay for the additional long calls, to convert the ratio spread into a bull spread. If the calls are bought, such a bull spread would break even with the stock above the higher striking price at expiration:

$$\text{Break-even cost of long calls} = \frac{\text{Number of short calls} \times \text{Difference in strikes} - \text{Total debit to date}}{\text{Number of naked calls}}$$

In the simple 2:1 example, the number of short calls was 2, the difference in the strikes was 5, the total debit was minus one (–1) (since it was actually a 1-point credit), and the number of naked calls is 1. Thus, the break-even cost of the additional long call is $[2 \times 5 - (-1)(1)]/1 = 11$. As another verification of the formula, consider the 10:5 spread at the same prices. The initial credit of this spread would be 5 points, and the break-even cost of the five additional long calls is 11 points each. Assume that the spreader bought two additional April 40's for 8 points each (16 debit). This would make the total debit to date of the spread equal to 11 points, and reduce the number of naked calls to 3. The break-even cost of the remaining 3 long calls that would need to be purchased if the stock continued to rally would be $(10 \times 5 - 11)/3 = 13$. This agrees with the observation made earlier. This formula can be used before actual follow-up action is implemented. For example, in the 10:5 spread, if the April 40's were selling for 8, the spreader might ask: "To what would I raise the purchase price of the remaining long calls if I buy 2 April 40's for 8 right now?" By using the formula, he could easily see that the answer would be 13.

ADJUSTING WITH THE DELTA

The theoretically-oriented spreader can use the delta-neutral ratio to monitor his spreads as well as to establish them. If the underlying stock moves up in price too far or down in price too far, the delta-neutral ratio of the spread will change. The spreader can then readjust his spread to a neutral status by buying some additional long calls on an upside movement by the stock, or by selling some additional short calls on a downward movement by the stock. Either action will serve to make the spread delta-neutral again. The public customer who is employing the delta-neutral adjustment method of follow-up action should be careful not to overadjust, because the commission costs would become prohibitive. A more detailed description of the use of deltas as a means of follow-up action is contained in Chapter 28 on mathematical applications, under the heading "Facilitation or Institutional Block Positioning." The general concept, however, is the same as that shown earlier for ratio writing.

Example: Early in this chapter, when selection criteria were described, a neutral ratio was determined to be 16:10, with XYZ at 44. Suppose, after establishing the spread, that the common rallied to 47. One could use the current deltas to adjust. This information is summarized in Table 11-4. The current neutral ratio is approximately 14:10. Thus, two of the short April 45's could be bought closing. In practice, one usually decreases his ratio by adding to the long side. Consequently, one would buy two April 40's, decreasing his overall ratio to 16:12, which is 1.33 and is close to the actual neutral ratio of 1.38. The position would therefore be delta-neutral once more.

An alternative way of looking at this is to use the equivalent stock position (ESP), which, for any option, is the multiple of the quantity times the delta times the shares per option. The last three lines of Table 11-4 show the ESP for each call and for the position as a whole. Initially, the position has an ESP of 0, indicating that it is perfectly delta-neutral. In the current situation, however, the position is delta short 140 shares. Thus, one could adjust the position to be delta-neutral by buying 140 shares of XYZ. If he wanted to use the options rather than the stock, he could buy two April 45's, which would add a delta long of 130 ESP (2 × .65 × 100), leaving the position delta short 10 shares, which is very near neutral. As pointed out in the above paragraph, the spreader probably should buy the call with the most intrinsic value – the April 40. Each one of these has an ESP of 90 (1 × .9 × 100). Thus, if one were bought, the position would be delta short 50 shares; if two were bought, the total position would be delta *long* 40 shares. It would be a matter of individual preference whether the spreader wanted to be long or short the "odd lot" of 40 or 50 shares, respectively.

TABLE 11-4.
Original and current prices and deltas.

	Original Situation	Current Situation
XYZ common	44	47
April 40 call	5	8
April 45 call	3	5
April 40 delta	.80	.90
April 45 delta	.50	.65
Neutral ratio	16:10 (.80/.50)	14:10 (.90/.65 = 1.38)
April 40 ESP	800 long (10 × .8 × 100)	900 long (10 × .9 × 100)
April 45 ESP	800 shrt (16 × .5 × 100)	1,040 shrt (16 × .65 × 100)
Total ESP	0 (neutral)	140 shrt

The ESP method is merely a confirmation of the other method. Either one works well. The spreader should become familiar with the ESP method because, in a position with many different options, it reduces the exposure of the entire position to a single number.

TAKING PROFITS

In addition to defensive action, the spreader may find that he can close the spread early to take a profit or to limit losses. If enough time has passed and the underlying stock is close to the maximum profit point – the higher striking price – the spreader may want to consider closing the spread and taking his profit. Similarly, if the underlying stock is somewhere between the two strikes as expiration draws near, the writer will normally find himself with a profit as the long call retains some intrinsic value and the short calls are nearly worthless. If at this time one feels that there is little to gain (a price decline might wipe out the long call value), he should close the spread and take his profit.

SUMMARY

Ratio spreads can be an attractive strategy, similar in some ways to ratio writing. Both strategies offer a large probability of making a limited profit. The ratio spread has limited downside risk, or possibly no downside risk at all. In addition, if the long call(s) in the spread can be bought with little or no time value premium in them, the ratio spread becomes a superior strategy to the ratio write. One can adjust the ratio used to reflect his opinion of the underlying stock or to make a neutral profit range if desired. The ratio adjustment can be accomplished by using the deltas of the options. In a broad sense, this is one of the more attractive forms of spreading, since the strategist is buying mostly intrinsic value and is selling a relatively large amount of time value.

CHAPTER 12

Combining Calendar and Ratio Spreads

The previous chapters on spreading introduced the basic types of spreads. The simplest forms of bull spreads, bear spreads, or calendar spreads can often be combined to produce a position with a more attractive potential. The butterfly spread, which is a combination of a bull spread and a bear spread, is an example of such a combination. The next three chapters are devoted to describing other combinations of spreads, wherein the strategist not only mixes basic strategies – bull, bear, and calendar – but uses varying expiration dates as well. Although they may seem overly complicated at first glance, these combinations are often employed by professionals in the field.

RATIO CALENDAR SPREAD

The *ratio calendar spread* is a combination of the techniques used in the calendar and ratio spreads. Recall that one philosophy of the calendar spread strategy was to sell the near-term call and buy a longer-term call, with both being out-of-the-money. This is a bullish calendar spread. If the underlying stock never advances, the spreader loses the entire amount of the relatively small debit that he paid for the spread. However, if the stock advances after the near-term call expires worthless, large profits are possible. It was stated that this bullish calendar spread philosophy had a small probability of attaining large profits, and that the few profits could easily exceed the preponderance of small losses.

The ratio calendar spread is an attempt to raise the probabilities while allowing for large potential profits. *In the ratio calendar spread, one sells a number of near-*

term calls while buying fewer of the intermediate-term or long-term calls. Since more calls are being sold than are being bought, naked options are involved. It is often possible to set up a ratio calendar spread for a credit, meaning that if the underlying stock never rallies above the strike, the strategist will still make money. However, since naked calls are involved, the collateral requirements for participating in this strategy may be large.

Example: As in the bullish calendar spreads described in Chapter 9, the prices are:

XYZ common, 45;
XYZ April 50 call, 1; and
XYZ July 50 call, 1½.

In the bullish calendar spread strategy, one July 50 is bought for each April 50 sold. This means that the spread is established for a debit of ½ point and that the investment is $50 per spread, plus commissions. The strategist using the ratio calendar spread has essentially the same philosophy as the bullish calendar spreader: The stock will remain below 50 until April expiration and may then rally. The ratio calendar spread might be set up as follows:

Buy 1 XYZ July 50 call at 1½	1½ debit
Sell 2 XYZ April 50 calls at 1 each	2 credit
Net	½ credit

Although there is no cash involved in setting up the ratio spread since it is done for a credit, there is a collateral requirement for the naked April 50 call.

If the stock remains below 50 until April expiration, the long call – the July 50 – will be owned free. After that, no matter what happens to the underlying stock, the spread cannot lose money. In fact, if the underlying stock advances dramatically after near-term expiration, large profits will accrue as the July 50 call increases in value. Of course, this is entirely dependent on the near-term call expiring worthless. If the underlying stock should rally above 50 before the April calls expire, the ratio calendar spread is in danger of losing a large amount of money because of the naked calls, and defensive action must be taken. Follow-up actions are described later.

The collateral required for the ratio calendar spread is equal to the amount of collateral required for the naked calls less the credit taken in for the spread. Since naked calls will be marked to market as the stock moves up, *it is always best to allow enough collateral to get to a defensive action point.* In the example above, suppose that one felt he would definitely be taking defensive action if the stock rallied to 53

before April expiration. He should then figure his collateral requirement as if the stock were at 53, regardless of what the collateral requirement is at the current time. *This is a prudent tactic whenever naked options are involved, since the strategist will never be forced into an unwanted close-out before his defensive action point is reached.* The collateral required for this example would then be as follows, assuming the call is trading at $3^1/_2$:

20% of 53	$1,060
Call premium	+ 350
Less initial credit	– 50
Total collateral to set aside	$1,360

The strategist is not really "investing" anything in this strategy, because his requirement is in the form of collateral, not cash. That is, his current portfolio assets need not be disturbed to set up this spread, although losses would, of course, create debits in the account. Many naked option strategies are similar in this respect, and the strategist may earn additional money from the collateral value of his portfolio without disturbing the portfolio itself. However, he should take care to operate such strategies in a conservative manner, since any income earned is "free," but losses may force him to disturb his portfolio. In light of this fact, it is always difficult to compute returns on investment in a strategy that requires only collateral to operate. One can, of course, compute the return on the maximum collateral required during the life of the position. The large investor participating in such a strategy should be satisfied with any sort of positive return.

Returning to the example above, the strategist would make his $50 credit, less commissions, if the underlying stock remained below 50 until July expiration. It is not possible to determine the results to the upside so definitively. If the April 50 calls expire worthless and then the stock rallies, the potential profits are limited only by time. The case in which the stock rallies before April expiration is of the most concern. If the stock rallies *immediately,* the spread will undoubtedly show a loss. If the stock rallies to 50 more slowly, but still before April expiration, it is possible that the spread will not have changed much. Using the same example, suppose that XYZ rallies to 50 with only a few weeks of life remaining in the April 50 calls. Then the April 50 calls might be selling at $1^1/_2$ while the July 50 call might be selling at 3. The ratio spread could be closed for even money at that point; the cost of buying back the 2 April 50's would equal the credit received from selling the one July 50. He would thus make $^1/_2$ point, less commissions, on the entire spread transaction. Finally, at the expiration date of the April 50 calls, one can estimate where he would break even. Suppose one estimated that the July 50 call would be selling for $5^1/_2$ points if XYZ were at 53 at April expiration. Since the April 50 calls would be selling for 3 at that

time (they would be at parity), there would be a debit of 1/2 point to close the ratio spread. The two April 50 calls would be bought for 6 points and the July 50 call sold for 5½ – a 1/2 debit. The entire spread transaction would thus have broken even, less commissions, at 53 at April expiration, since the spread was put on for a 1/2 credit and was taken off for a 1/2 debit. *The risk to the upside depends clearly, then, on how quickly the stock rallies above 50 before April expiration.*

CHOOSING THE SPREAD

Some of the same criteria used in setting up a bullish calendar spread apply here as well. Select a stock that is volatile enough to move above the striking price in the allotted time – after the near-term expires, but before the long call expires. Do not use calls that are so far out-of-the-money that it would be virtually impossible for the stock to reach the striking price. Always set up the spread for a credit, commissions included. This will assure that a profit will be made even if the stock goes nowhere. However, if the credit has to be generated by using an extremely large ratio – greater than 3 short calls to every long one – one should probably reject that choice, since the potential losses in an immediate rally would be large.

The *upside break-even point* prior to April expiration should be determined using a pricing model. Such a model, or the output from one, can generally be obtained from a data service or from some brokerage firms. It is useful to the strategist to know exactly how much room he has to the upside if the stock begins to rally. This will allow him to take defensive action in the form of closing out the spread before his break-even point is reached. Since a pricing model can estimate a call price for any length of time, the strategist can compute his break-even points at April expiration, 1 month before April expiration, 6 weeks before, and so on. When the long option in a spread expires at a different time from the short option, the break-even point is dynamic. That is, it changes with time. Table 12-1 shows how this information might be accumulated for the example spread used above. Since this example spread was established for a 1/2-point credit with the stock at 45, the break-even points would be at stock prices where the spread could be removed for a 1/2-point debit. Suppose the spread was initiated with 95 days remaining until April expiration. In each line of the table, the cost for buying 2 April 50's is 1/2 point more than the price of the July 50. That is, there would be a 1/2-point debit involved in closing the spread at those prices. Notice that *the break-even price increases as time passes.* Initially, the spread would show a loss if the stock moved up at all. This is to be expected, since an immediate move would not allow for any erosion in the time value premium of the near-term calls. As more and more time passes, time weighs

more heavily on the near-term April calls than on the longer-term July call. Once the strategist has this information, he might then look at a chart of the underlying stock. If there is resistance for XYZ below 53, his eventual break-even point at April expiration, he could then feel more confident about this spread.

FOLLOW-UP ACTION

The main purpose of defensive action in this strategy is to limit losses if the stock should rally before April expiration. The strategist should be quick to close out the spread before any serious losses accrue. The long call quite adequately compensates for the losses on the short calls up to a certain point, a fact demonstrated in Table 12-1. However, the stock cannot be allowed to run. A rule of thumb that is often useful is to close the spread if the stock breaks out above technical resistance or if it breaks above the eventual break-even point at expiration. In the example above, the strategist would close the spread if, at any time, XYZ rose above 53 (before April expiration, of course).

If a significant amount of time has passed, the strategist might act even more quickly in closing the spread. As was shown earlier, if the stock rallies to 50 with only a few weeks of time remaining, the spread may actually be at a slight profit at that time. It is often the best course of action to take the small profit, if the stock rises above the striking price.

TABLE 12-1.
Break-even points changing over time.

Days Remaining until April Expiration	Break-Even Point (Stock Price)	Estimated April 50 Price	Estimated July 50 Price
90	45	1	$1\frac{1}{2}$
60	48	$1\frac{1}{2}$	$2\frac{1}{2}$
30	51	$2\frac{1}{2}$	$4\frac{1}{2}$
0	53	3	$5\frac{1}{2}$

THE PROBABILITIES ARE GOOD

This is a strategy with a rather large probability of profit, provided that the defensive action described above is adhered to. The spread will make money if the stock never rallies above the striking price, since the spread is established for a credit. This in

itself is a rather high-probability event, because the stock is initially below the striking price. In addition, the spread can make large potential profits if the stock rallies after the near-term calls expire. Although this is a much less probable event, the profits that can accrue add to the expected return of the spread. The only time the spread loses is when the stock rallies quickly, and the strategist should close out the spread in that case to limit losses.

Although Table 12-2 is not mathematically definitive, it can be seen that this strategy has a positive expected return. Small profits occur more frequently than small losses do, and sometimes large profits can occur. These expected outcomes, when coupled with the fact that the strategist may utilize collateral such as stocks, bonds, or government securities to set up these spreads, demonstrate that this is a viable strategy for the advanced investor.

TABLE 12-2.
Profitability of ratio calendar spreading.

Event	Outcome	Probability
Stock never rallies above strike	Small profit.	Large probability
Stock rallies above strike in a short time	Small loss if defensive action employed	Small probability
Stock rallies above strike after near-term call expires	Large potential profit	Small probability

DELTA-NEUTRAL CALENDAR SPREADS

The preceding discussion dealt with a specific kind of ratio calendar spread, the out-of-the-money call spread. A more accurate ratio can be constructed using the deltas of the calls involved, similar to the ratio spreads in Chapter 11. The spread can be created with either out-of-the-money calls or in-the-money calls. The former has naked calls, while the latter has extra long calls. Both types of ratio calendars are described.

In either case, the number of calls to sell for each one purchased is determined by dividing the delta of the long call by the delta of the short call. This is the same for any ratio spread, not just calendars.

Example: Suppose XYZ is trading at 45 and one is considering using the July 50 call and the April 50 call to establish a ratio calendar spread. This is the same situation

that was described earlier in this chapter. Furthermore, assume that the deltas of the calls in question are .25 for the July and .15 for the April. Given that information, one can compute the neutral ratio to be 1.667 to 1 (.25/.15). That is, one would sell 1.667 calls for each one he bought; restated, he would sell 5 for each 3 bought.

This out-of-the-money neutral calendar is typical. One normally sells more calls than he buys to establish a neutral calendar when the calls are out-of-the-money. The ramifications of this strategy have already been described in this chapter. Follow-up strategy is slightly different, though, and is described later.

THE IN-THE-MONEY CALENDAR SPREAD

When the calls are in-the-money, the neutral spread has a distinctly different look. An example will help in describing the situation.

Example: XYZ is trading at 49, and one wants to establish a neutral calendar spread using the July 45 and April 45 calls. The deltas of these in-the-money calls are .8 for the April and .7 for the July. *Note that for in-the-money calls, a shorter-term call has a higher delta than a longer-term call.*

The neutral ratio for this in-the-money spread would be .875 to 1 (.7/.8). This means that .875 calls would be sold for each one bought; restated, 7 calls would be sold and 8 bought. Thus, the spreader is buying more calls than he is selling when establishing an in-the-money neutral calendar. In some sense, one is establishing some "regular" calendar spreads (seven of them, in this example) and simultaneously buying a few extra long calls to go along with them (one extra long call, in this example).

This type of position can be quite attractive. First of all, there is no risk to the upside as there is with the out-of-the-money calendar; the in-the-money calendar would make money, because there are extra long calls in the position. Thus, if there were to be a large gap to the upside in XYZ – perhaps caused by a takeover attempt – the in-the-money calendar would make money. If, on the other hand, XYZ stays in the same area, then the regular calendar spread portion of the strategy will make money. Even though the extra call would probably lose some time value premium in that event, the other seven spreads would make a large enough profit to easily compensate for the loss on the one long call. The least desirable result would be for XYZ to drop precipitously. However, in that case, the loss is limited to the amount of the initial debit of the spread. Even in the case of XYZ dropping, though, follow-up action can be taken. There are no naked calls to margin with this strategy, making it attractive to many smaller investors. In the above example, one would need to pay for the entire debit of the position, but there would be no further requirements.

FOLLOW-UP ACTION

If one decides to preserve a neutral strategy with follow-up action in either type of ratio call calendar, he would merely need to look at the deltas of the calls and keep the ratio neutral. Doing so might mean that one would switch from one type of calendar spread to the other, from the out-of-the-money with naked calls to the in-the-money with extra long calls, or vice versa. For example, if XYZ started at 45, as in the first example, one would have sold more calls than he bought. If XYZ then rallied above 50, he would have to move his position into the in-the-money ratio and get long more calls than he is short.

While such follow-up action is strategically correct – maintaining the neutral ratio – it might not make sense practically, especially if the size of the original spread were small. If one had originally sold 5 and bought 3, he would be better to adhere to the follow-up strategy outlined earlier in this chapter. The spread is not large enough to dictate adjusting via the delta-neutral ratios. If, however, a large trader had originally sold 500 calls and bought 300, then he has enough profitability in the spread to make several adjustments along the way.

In a similar manner, the spreader who had established a small in-the-money calendar might decide not to bother rationing the spread if the stock dropped below the strike. He knows his risk is limited to his initial debit, and that would be small for a small spread. He might not want to introduce naked options into the position if XYZ declines. However, if the same spread were established by a large trader, it should be adjusted because of the greater tolerance of the spread to being adjusted, merely because of its size.

CHAPTER 13

Reverse Spreads

In general, when a strategy has the term "reverse" in its name, the strategy is the opposite of a more commonly used strategy. The reader should be familiar with this nomenclature from the earlier discussions comparing ratio writing (buying stock and selling calls) with reverse hedging (shorting stock and buying calls). If the reverse strategy is sufficiently well-known, it usually acquires a name of its own. For example, the bear spread is really the reverse of the bull spread, but the bear spread is a popular enough strategy in its own right to have acquired a shorter, unique name.

REVERSE CALENDAR SPREAD

The reverse calendar spread is an infrequently used strategy, at least for public customers trading stock or index options, because of the margin requirements. However, even then, it *does* have a place in the arsenal of the option strategist. Meanwhile, professionals and futures option traders use the strategy with more frequency because the margin treatment is more favorable for them.

As its name implies, the reverse calendar spread is a position that is just the opposite of a "normal" calendar spread. In the *reverse* calendar spread, one sells a long-term call option and simultaneously buys a shorter-term call option. The spread can be constructed with puts as well, as will be shown in a later chapter. Both calls have the same striking price.

This strategy will make money if one of two things happens: Either (1) the stock price moves away from the striking price by a great deal, or (2) the implied volatility of the options involved in the spread shrinks. For readers familiar with the "normal" calendar spread strategy, the first way to profit should be obvious, because a "normal"

calendar spread makes the most money if the stock is right at the strike price at expiration, and it loses money if the stock rises or falls too far.

As with any spread involving options expiring in differing months, it is common practice to look at the profitability of the position at or before the near-term expiration. An example will show how this strategy can profit.

Example: Suppose the current month is April and that XYZ is trading at 80. Furthermore, suppose that XYZ's options are quite expensive, and one believes the underlying stock will be volatile. A reverse calendar spread would be a way to profit from these assumptions. The following prices exist:

XYZ December 80 call:	12
XYZ July 80 call:	7

A reverse calendar spread is established by *selling* the December 80 call for 12 points, and buying the July 80 call for 7, a net credit of 5 points for the spread.

If, later, XYZ falls dramatically, both call options will be nearly worthless and the spread could be bought back for a price well below 5. For example, if XYZ were to fall to 50 in a month or so, the July 80 call would be nearly worthless and the December 80 call could be bought back for about a point. Thus, the spread would have shrunk from its initial price of 5 to a price of about 1, a profit of 4 points.

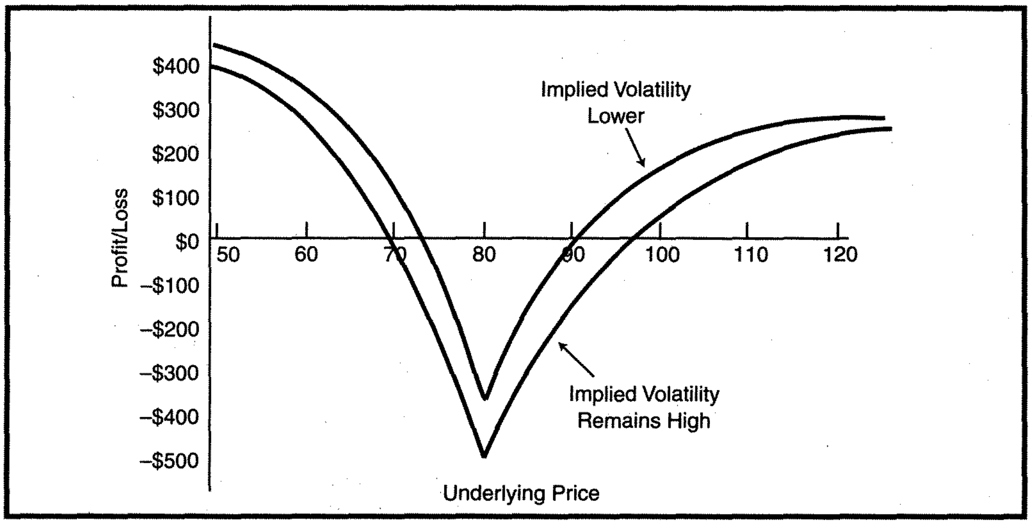
The other way to make money would be for implied volatility to decrease. Suppose implied volatility dropped after a month had passed. Then the spread might be worth something like 4 points – an unrealized profit of about 1 point, since it was sold for a price of 5 initially.

The profit graph in Figure 13-1 shows the profitability of the reverse calendar. There are two lines on the graph, both of which depict the results at the expiration of the near-term option (the July 80 call in the above example). The lower line shows where profits and losses would occur if implied volatility remained unchanged. You can see that the position could profit if XYZ were to rise above 98 or fall below 70. In addition, the higher curve on the graph shows where profits would lie if implied volatility *fell* prior to expiration of the near-term options. In that case, additional profits would accrue, as depicted on the graph.

So there are two ways to make money with this strategy, and it is therefore best to establish it when implied volatility is high *and* the underlying has a tendency to be volatile.

The problem with this spread, for stock and index option traders, is that the call that is sold is considered to be naked. This is preposterous, of course, since the short-term call is a perfectly valid hedge until it expires. Yet the margin requirements remain onerous. When they were overhauled recently, this glaring inefficiency was

Figure 13-1.
Calendar spread sale at near-term expiration.



allowed to stand because none of the member firms cared about changing it. Still, if one has excess collateral – perhaps from a large stock portfolio – and is interested in generating excess income in a hedged manner, then the strategy might be applicable for him as well. Futures option traders receive more favorable margin requirements, and it thus might be a more economical strategy for them.

REVERSE RATIO SPREAD (BACKSPREAD)

A more popular reverse strategy is the *reverse ratio call spread, which is commonly known as a backspread.* In this type of spread, one would sell a call at one striking price and then would buy several calls at a higher striking price. This is exactly the opposite of the ratio spread described in Chapter 11. Some traders refer to any spread with unlimited profit potential on at least one side as a backspread. Thus, in most backspreading strategies, *the spreader wants the stock to move dramatically.* He does not generally care whether it moves up or down. Recall that in the reverse hedge strategy (similar to a straddle buy) described in Chapter 4, the strategist had the potential for large profits if the stock moved either up or down by a great deal. In the backspread strategy discussed here, large potential profits exist if the stock moves up dramatically, but there is limited profit potential to the downside.

Example: XYZ is selling for 43 and the July 40 call is at 4, with the July 45 call at 1. A reverse ratio spread would be established as follows:

Buy 2 July 45 calls at 1 each	2 debit
Sell 1 July 40 call at 4	4 credit
Net	2 credit

These spreads are generally established for credits. In fact, *if the spread cannot be initiated at a credit, it is usually not attractive.* If the underlying stock drops in price and is below 40 at July expiration, all the calls will expire worthless and the strategist will make a profit equal to his initial credit. The maximum *downside* potential of the reverse ratio spread is equal to the initial credit received. On the other hand, if the stock rallies substantially, the potential upside profits are unlimited, since the spreader owns more calls than he is short. *Simplistically, the investor is bullish and is buying out-of-the-money calls but is simultaneously hedging himself by selling another call.* He can profit if the stock rises in price, as he thought it would, but he also profits if the stock collapses and all the calls expire worthless.

This strategy has limited risk. *With most spreads, the maximum loss is attained at expiration at the striking price of the purchased call.* This is a true statement for backspreads.

Example: If XYZ is at exactly 45 at July expiration, the July 45 calls will expire worthless for a loss of $200 and the July 40 call will have to be bought back for 5 points, a $100 loss on that call. The total loss would thus be $300, and this is the most that can be lost in this example. If the underlying stock should rally dramatically, this strategy has unlimited profit potential, since there are two long calls for each short one. In fact, one can always compute the upside break-even point at expiration. That break-even point happens to be 48 in this example. At 48 at July expiration, each July 45 call would be worth 3 points, for a net gain of $400 on the two of them. The July 40 call would be worth 8 with the stock at 48 at expiration, representing a $400 loss on that call. Thus, the gain and the loss are offsetting and the spread breaks even, except for commissions, at 48 at expiration. If the stock is higher than 48 at July expiration, profits will result.

Table 13-1 and Figure 13-2 depict the potential profits and losses from this example of a reverse ratio spread. Note that the profit graph is exactly like the profit graph of a ratio spread that has been rotated around the stock price axis. Refer to Figure 11-1 for a graph of the ratio spread. There is actually a range outside of which profits can be made – below 42 or above 48 in this example. The maximum loss occurs at the striking price of the purchased calls, or 45, at expiration.

There are no naked calls in this strategy, so *the investment is relatively small.* The strategy is actually a long call added to a bear spread. In this example, the bear

TABLE 13-1.
Profits and losses for reverse ratio spread.

XYZ Price at July Expiration	Profit on 1 July 40	Profit on 2 July 45's	Total Profit
35	+$ 400	−$ 200	+$ 200
40	+ 400	− 200	+ 200
42	+ 200	− 200	0
45	− 100	− 200	− 300
48	− 400	+ 400	0
55	− 1,100	+ 1,800	+ 700
70	− 2,600	+ 4,800	+ 2,200

spread portion is long the July 45 and short the July 40. This requires a $500 collateral requirement, because there are 5 points difference in the striking prices. The credit of $200 received for the entire spread can be applied against the initial requirement, so that the total requirement would be $300 plus commissions. There is no increase or decrease in this requirement, since there are no naked calls.

Notice that *the concept of a delta-neutral spread can be utilized in this strategy,* in much the same way that it was used for the ratio call spread. The number of calls to buy and sell can be computed mathematically by using the deltas of the options involved.

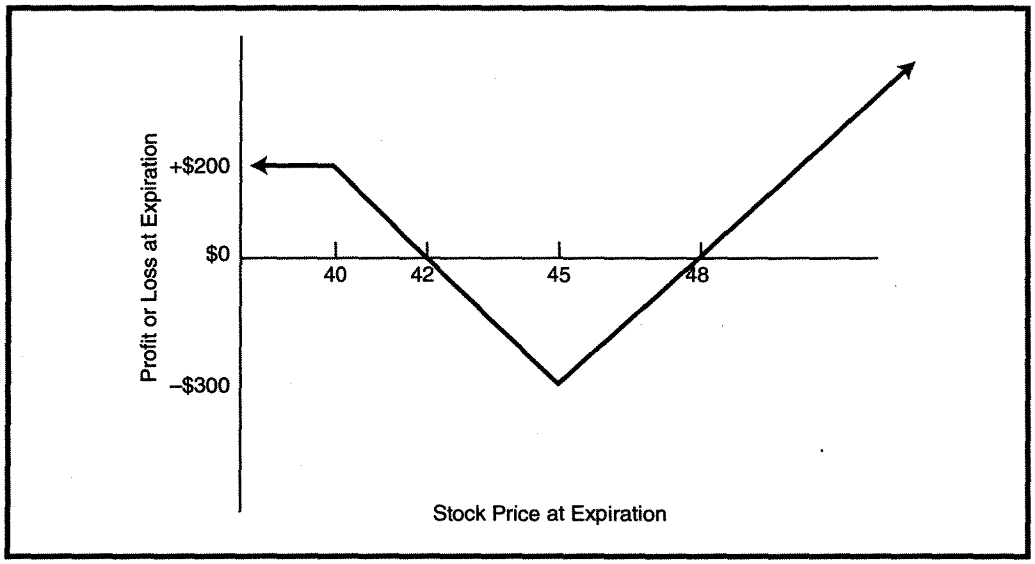
Example: The neutral ratio is determined by dividing the delta of the July 45 into the delta of the July 40.

Prices		Delta
XYZ common:	= 43	
XYZ July 40 call:	4	.80
XYZ July 45 call:	1	.35

In this case, that would be a ratio of 2.29:1 (.80/.35). That is, if one sold 5 July 40's, he would buy 11 July 45's (or if he sold 10, he would then buy 23). By beginning with a neutral ratio, the spreader should be able to make money on a quick move by the stock in either direction.

The neutral ratio can also help the spreader to avoid being too bearish or too bullish to begin with. For example, a spreader would not be bullish enough if he

FIGURE 13-2.
Reverse ratio spread (backspread).



merely used a 2:1 ratio for convenience, instead of using the 2.3:1 ratio. If anything, one might normally establish the spread with an extra bullish emphasis, since the largest profits are to the upside. There is little reason for the spreader to have too little bullishness in this strategy. Thus, if the deltas are correct, the neutral ratio can aid the spreader in the determination of a more accurate initial ratio.

The strategist must be alert to the possibility of early exercise in this type of spread, since he has sold a call that is in-the-money. Aside from watching for this possibility, there is little in the way of defensive follow-up action that needs to be implemented, since the risk is limited by the nature of the position. He might take profits by closing the spread if the stock rallies before expiration.

This strategy presents a reasonable method of attempting to capitalize on a large stock movement with little tie-up of collateral. *Generally, the strategist would seek out volatile stocks* for implementation of this strategy, because he would want as much potential movement as possible by the time the calls expire. In Chapter 14, it will be shown that this strategy can become more attractive by buying calls with a longer maturity than the calls sold.

CHAPTER 14

Diagonalizing a Spread

When one uses both different striking prices and different expiration dates in a spread, it is a diagonal spread. Generally, the long side of the spread would expire later than the short side of the spread. Note that this is within the definition of a spread for margin purposes: The long side must have a maturity equal to or longer than the maturity of the short side. With the exception of calendar spreads, all the previous chapters on spreads have described ones in which the expiration dates of the short call and the long call were the same. However, any of these spreads can be diagonalized; one can replace the long call in any spread with one expiring at a later date.

In general, *diagonalizing a spread in this manner makes it slightly more bearish at near-term expiration.* This can be seen by observing what would happen if the stock fell or rose substantially. If the stock falls, the long side of the spread will retain some value because of its longer maturity. Thus, a diagonal spread will generally do better to the downside than will a regular spread. If the stock rises substantially, all calls will come to parity. Thus, there is no advantage in the long-term call; it will be selling for approximately the same price as the purchased call in a normal spread. However, since the strategist had to pay more originally for the longer-term call, his upside profits would not be as great.

A diagonalized position has an advantage in that one can reestablish the position if the written calls expire worthless in the spread. Thus, the increased cost of buying a longer-term call initially may prove to be a savings if one can write against it twice. These tactics are described for various spread strategies.

THE DIAGONAL BULL SPREAD

A vertical call bull spread consists of buying a call at a lower striking price and selling a call at a higher striking price, both with the same expiration date. *The diagonal*

bull spread would be similar except that one would buy a longer-term call at the lower strike and would sell a near-term call at the higher strike. The number of calls long and short would still be the same. By diagonalizing the spread, the position is hedged somewhat on the downside in case the stock does not advance by near-term expiration. Moreover, once the near-term option expires, the spread can often be reestablished by selling the call with the next maturity.

Example: The following prices exist:

	Strike	April	July	October	Stock Price
XYZ	30	3	4	5	32
XYZ	35	1	1½	2	32

A vertical bull spread could be established in any of the expiration series by buying the call with 30 strike and selling the call with 35 strike. A diagonal bull spread would consist of buying the July 30 or October 30 and selling the April 35. To compare a vertical bull spread with a diagonal spread, the following two spreads will be used:

Vertical bull spread: buy the April 30 call, sell the April 35 – 2 debit
Diagonal bull spread: buy the July 30 call, sell the April 35 – 3 debit

The vertical bull spread has a 3-point potential profit if XYZ is above 35 at April expiration. The maximum risk in the normal bull spread is 2 points (the original debit) if XYZ is anywhere below 30 at April expiration. By diagonalizing the spread, the strategist lowers his potential profit slightly at April expiration, but also lowers the probability of losing 2 points in the position. Table 14-1 compares the two types of spreads at April expiration. The price of the July 30 call is estimated in order to derive the estimated profits or losses from the diagonal bull spread at that time. If the underlying stock drops too far – to 20, for example – both spreads will experience nearly a total loss at April expiration. However, the diagonal spread will not lose its entire value if XYZ is much above 24 at expiration, according to Table 14-1. The diagonal spread actually has a smaller dollar loss than the normal spread between 27 and 32 at expiration, despite the fact that the diagonal spread was more expensive to establish. On a percentage basis, the diagonal spread has an even larger advantage in this range. If the stock rallies above 35 by expiration, the normal spread will provide a larger profit. There is an interesting characteristic of the diagonal spread that is shown in Table 14-1. If the stock advances substantially and all the calls come to parity, the profit on the diagonal spread is limited to 2 points. However, if the stock is near 35 at April expiration, the long call will have some time premium in it and the

TABLE 14-1.
Comparison of spreads at expiration.

XYZ Price at April Expiration	April 30 Price	April 35 Price	July 30 Price	Vertical Bull Spread Profit	Diagonal Spread Profit
20	0	0	0	−$200	−$300
24	0	0	½	− 200	− 250
27	0	0	1	− 200	− 200
30	0	0	2	− 200	− 100
32	2	0	3	0	0
35	5	0	5½	+ 300	+ 250
40	10	5	10	+ 300	+ 200
45	15	10	15	+ 300	+ 200

spread will actually widen to more than 5 points. Thus, *the maximum area of profit at April expiration for the diagonal spread is to have the stock near the striking price of the written call.* The figures demonstrate that the diagonal spread gives up a small portion of potential upside profits to provide a hedge to the downside.

Once the April 35 call expires, the diagonal spread can be closed. However, if the stock is below 35 at that time, it may be more prudent to then sell the July 35 call against the July 30 call that is held long. This would establish a normal bull spread for the 3 months remaining until July expiration. Note that if XYZ were still at 32 at April expiration, the July 35 call might be sold for 1 point if the stock's volatility was about the same. This should be true, since the April 35 call was worth 1 point with the stock at 32 three months before expiration. Consequently, the strategist who had pursued this course of action would end up with a normal July bull spread for a net debit of 2 points: He originally paid 4 for the July 30 call, but then sold the April 35 for 1 point and subsequently sold the July 35 for 1 point. By looking at the table of prices for the first example in this chapter, the reader can see that it would have cost 2½ points to set up the normal July bull spread originally. Thus, by diagonalizing and having the near-term call expire worthless, the strategist is able to acquire the normal July bull spread at a cheaper cost than he could have originally. This is a specific example of how *the diagonalizing effect can prove beneficial if the writer is able to write against the same long call two times,* or three times if he originally purchased the longest-term call. In this example, if XYZ were anywhere between 30 and 35 at April expiration, the spread would be converted to a normal July bull spread. If the stock were above 35, the spread should be closed to take the profit. Below 30, the July 30 call would probably be closed or left outright long.

In summary, the diagonal bull spread may often be an improvement over the normal bull spread. The diagonal spread is an improvement when the stock remains relatively unchanged or falls, up until the near-term written call expires. At that time, the spread can be converted to a normal bull spread if the stock is at a favorable price. Of course, if at any time the underlying stock rises above the higher striking price at an expiration date, the diagonal spread will be profitable.

OWNING A CALL FOR "FREE"

Diagonalization can be used in other spread strategies to accomplish much the same purposes already described; but in addition, it may also be possible for the spreader to wind up owning a long call at a substantially reduced cost, possibly even for free.

The easiest way to see this would be to consider a *diagonal bear spread.*

Example: XYZ is at 32 and the near-term April 30 call is selling for 3 points while the longer-term July 35 call is selling for 1½ points. A diagonal bear spread could be established by selling the April 30 and buying the July 35. This is still a bear spread, because a call with a lower striking price is being sold while a call at a higher strike is being purchased. However, since the purchased call has a longer maturity date than the written call, the spread is diagonalized.

This diagonal bear spread will make money if XYZ falls in price before the near-term April call expires. For example, if XYZ is at 29 at expiration, the written call will expire worthless and the July 35 will still have some value, perhaps ½. Thus, the profit would be 3 points on the April 30, less a 1-point loss on the July 35, for an overall profit of 2 points. The risk in the position lies to the upside, just as in a regular bear spread. If XYZ should advance by a great deal, both options would be at parity and the spread would have widened to 5 points. Since the initial credit was 1½ points, the loss would be 5 minus 1½, or 3½ points in that case. As in all diagonal spreads, the spread will do slightly better to the downside because the long call will hold some value, but it will do slightly worse to the upside if the underlying stock advances substantially.

The reason that a strategist might attempt a diagonal bear spread would *not* be for the slight downside advantage that the diagonalizing effect produces. Rather it would be because he has a chance of *owning* the July 35 *call* – the longer-term call – *for a substantially reduced cost.* In the example, the cost of the July 35 call was 1½ points and the premium received from the sale of the April 30 call was 3 points. If the spreader can make 1½ points from the sale of the April 30 call, he will have completely covered the cost of his July option. He can then sit back and hope for a rally

by the underlying stock. If such a rally occurred, he could make unlimited profits on the long side. If it did not, he loses nothing.

Example: Assume that the same spread was established as in the last example. Then, if XYZ is at or below 31½ at April expiration, the April 30 call can be purchased for 1½ points or less. Since the call was originally sold for 3, this would represent a profit of at least 1½ points on the April 30 call. This profit on the near-term option covers the entire cost of the July 35. Consequently, the strategist owns the July 35 for free. If XYZ never rallies above 35, he would make nothing from the overall trade. However, if XYZ were to rally above 35 after April expiration (but before July expiration, of course), he could make potentially large profits. Thus, *when one establishes a diagonal spread for a credit, there is always the potential that he could own a call for free.* That is, the profits from the sale of the near-term call could equal or exceed the original cost of the long call. This is, of course, a desirable position to be in, for if the underlying stock should rally substantially after profits are realized on the short side, large profits could accrue.

DIAGONAL BACKSPREADS

In an analogous strategy, one might buy more than one longer-term call against the short-term call that is sold. Using the foregoing prices, one might sell the April 30 for 3 points and buy 2 July 35's at 1½ points each. This would be an *even money spread.* The credits equal the debits when the position is established. If the April 30 call expires worthless, which would happen if the stock was below 30 in April, the spreader would own 2 July 35 calls for free. Even if the April 30 does not expire totally worthless, but if some profit can be made on the sale of it, the July 35's will be owned at a reduced cost. In Chapter 13, when reverse spreads were discussed, the strategy in which one sells a call with a lower strike and then buys more calls at a higher strike was termed a reverse ratio spread, or backspread. The strategy just described is merely the *diagonalizing of a backspread.* This is a strategy that is favored by some professionals, because the short call reduces the risk of owning the longer-term calls if the underlying stock declines. Moreover, if the underlying stock advances, the preponderance of long calls with a longer maturity will certainly outdistance the losses on the written call. The worst situation that could result would be for the underlying stock to rise very slightly by near-term expiration. If this happened, it might be possible to lose money on both sides of the spread. This would have to be considered a rather low-probability event, though, and would still represent a limited loss, so it does not substantially offset the positive aspects of the strategy.

Any type of spread may be diagonalized. There are some who prefer to diagonalize even butterfly spreads, figuring that the extra time to maturity in the purchased calls will be of benefit. Overall, the benefits of diagonalizing can be generalized by recalling the way in which the decay of the time value premium of a call takes place. Recall that it was determined that a call loses most of its time value premium in the last stages of its life. When it is a very long-term option, the rate of decay is small. Knowing this fact, it makes sense that one would want to sell options with a short life remaining, so that the maximum benefit of the decay could be obtained. Correspondingly, the purchase of a longer-term call would mean that the buyer is not subjecting himself to a substantial loss in time value premium, at least over the first three months of ownership. A diagonal spread encompasses both of these features – selling a short-term call to try to obtain the maximum rate of time decay, while buying a longer-term call to try to lessen the effect of time decay on the long side.

CALL OPTION SUMMARY

This concludes the description of strategies that utilize only call options. The call option has been seen to be a vehicle that the astute strategist can use to set up a wide variety of positions. He can be bullish or bearish, aggressive or conservative. In addition, he can attempt to be neutral, trying to capitalize on the probability that a stock will not move very far in a short time period.

The investor who is not familiar with options should generally begin with a simple strategy, such as covered call writing or outright call purchases. The simplest types of spreads are the bull spread, the bear spread, and the calendar spread. The more sophisticated investor might consider using ratios in his call strategies – ratio writing against stock or ratio spreading using only calls.

Once the strategist feels that he understands the risk and reward relationships between longer-term and short-term calls, between in-the-money and out-of-the-money calls, and between long calls and short calls, he could then consider utilizing the most advanced types of strategies. This might include reverse ratio spreads, diagonal spreads, and more advanced types of ratios, such as the ratio calendar spread.

A great deal of information, some of it rather technical in detail, has been presented in preceding chapters. The best pattern for an investor to follow would be to attempt only strategies that he fully comprehends. This does not mean that he merely understands the profitability aspects (especially the risk) of the strategy. One must also be able to readily understand the potential effects of early assignments, large dividend payments, striking price adjustments, and the like, if he is going to operate advanced strategies. Without a full understanding of how these things might affect one's position, one cannot operate an advanced strategy correctly.

PART III

Put Option Strategies

INTRODUCTION

A *put option* gives the holder the right to *sell* the underlying security at the striking price at any time until the expiration date of the option. Listed put options are slightly newer than listed call options, having been introduced on June 3, 1977. The introduction of listed puts has provided a much wider range of strategies for both conservative and aggressive investors. The call option is least effective in strategies in which downward price movement by the underlying stock is concerned. The put option is a useful tool in that case.

All stocks with listed call options have listed put options as well. The use of puts or the combination of puts and calls can provide more versatility to the strategist.

When listed put options exist, it is no longer necessary to implement strategies involving long calls and short stock. Listed put options can be used more efficiently in such situations. There are many similarities between call strategies and put strategies. For example, put spread strategies and call spread strategies employ similar tactics, although there are technical differences, of course. In certain strategies, the tactics for puts may appear largely to be a repetition of those used for calls, but they are nevertheless spelled out in detail here. The strategies that involve the use of both puts and calls together – straddles and combinations – have techniques of their own, but even in these cases the reader will recognize certain similarities to strategies previously discussed. Thus, the introduction of put options not only widens the realm of potential strategies, but also makes more efficient some of the strategies previously described.

CHAPTER 15

Put Option Basics

Much of the same terminology that is applied to call options also pertains to put options. *Underlying security, striking price,* and *expiration date* are all terms that have the same meaning for puts as they do for calls. The expiration dates of listed put options agree with the expiration dates of the calls on the same underlying stock. In addition, puts and calls have the same striking prices. This means that if there are options at a certain strike, say on a particular underlying stock that has both listed puts and calls, both calls at 50 and puts at 50 will be trading, regardless of the price of the underlying stock. Note that it is no longer sufficient to describe an option as an "XYZ July 50." It must also be stated whether the option is a put or a call, for an XYZ July 50 call and an XYZ July 50 put are two different securities.

In many respects, the put option and its associated strategies will be very nearly the opposite of corresponding call-oriented strategies. However, *it is not correct to say that the put is exactly the opposite of a call.* In this introductory section on puts, the characteristics of puts are described in an attempt to show how they are similar to calls and how they are not.

PUT STRATEGIES

In the simplest terms, *the outright buyer of a put is hoping for a stock price decline* in order for his put to become more valuable. If the stock were to decline well below the striking price of the put option, the put holder could make a profit. The holder of the put could buy stock in the open market and then exercise his put to sell that stock for a profit at the striking price, which is higher.

Example: If XYZ stock is at 40, an XYZ July 50 put would be worth at least 10 points, for the put grants the holder the right to sell XYZ at 50 – 10 points above its current

INTRODUCTION

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Example: If XYZ stock is at 40, an XYZ July 50 put would be worth at least 10 points, for the put grants the holder the right to sell XYZ at 50 – 10 points above its current

price. On the other hand, if the stock price were *above* the striking price of the put option at expiration, the put would be worthless. No one would logically want to exercise a put option to sell stock at the striking price when he could merely go to the open market and sell the stock for a higher price. Thus, *as the price of the underlying stock declines, the put becomes more valuable.* This is, of course, the opposite of a call option's price action.

The meaning of in-the-money and out-of-the-money are altered when one is speaking of put options. *A put is considered to be in-the-money when the underlying stock is below the striking price of the put option; it is out-of-the-money when the stock is above the striking price.* This, again, is the opposite of the call option. If XYZ is at 45, the XYZ July 50 put is in-the-money and the XYZ July 50 call is out-of-the-money. However, if XYZ were at 55, the July 50 put would be out-of-the-money while the July 50 call would be in-the-money. The broad definition of an in-the-money option as "an option that has intrinsic value" would cover the situation for both puts and calls. Note that a put option has intrinsic value when the underlying stock is below the striking price of the put. That is, the put has some "real" value when the stock is below the striking price.

The intrinsic value of an in-the-money put is merely the difference between the striking price and the stock price. Since the put is an option (to sell), it will generally sell for more than its intrinsic value when there is time remaining until the expiration date. This excess value over its intrinsic value is referred to as the *time value premium,* just as is the case with calls.

Example: XYZ is at 47 and the XYZ July 50 put is selling for 5, the intrinsic value is 3 points (50 – 47), so the time value premium must be 2 points. The time value premium of an in-the-money put option can always be quickly computed by the following formula:

$$\begin{array}{l}\textit{Time value premium} \\ \text{(in-the-money put)}\end{array} = \text{Put option} + \text{Stock price} - \text{Striking price}$$

This is not the same formula that was applied to in-the-money call options, although it is always true that the time value premium of an option is the excess value over intrinsic value.

$$\begin{array}{l}\textit{Time value premium} \\ \text{(in-the-money call)}\end{array} = \text{Call option} + \text{Striking price} - \text{Stock price}$$

If the put is out-of-the-money, the entire premium of the put is composed of time value premium, for the intrinsic value of an out-of-the-money option is always zero.

The *time value premium of a put is largest when the stock is at the striking price of the put.* As the option becomes deeply in-the-money or deeply out-of-the-money, the time value premium will shrink substantially. These statements on the magnitude of the time value premium are true for both puts and calls. Table 15-1 will help to illustrate the relationship of stock price and option price for both puts and calls. The reader may want to refer to Table 1-1, which described the time value premium relationship for calls. Table 15-1 describes the prices of an XYZ July 50 call option and an XYZ July 50 put option.

Table 15-1 demonstrates several basic facts. As the stock drops, the actual price of a call option decreases while the value of the put option increases. Conversely, as the stock rises, the call option increases in value and the put option decreases in value. Both the put and the call have their maximum time value premium when the stock is exactly at the striking price. However, *the call will generally sell for more than the put when the stock is at the strike.* Notice in Table 15-1 that, with XYZ at 50, the call is worth 5 points while the put is worth only 4 points. This is true in general, except in the case of a stock that pays a large dividend. This phenomenon has to do with the cost of carrying stock. More will be said about this effect later. Table 15-1 also describes an effect of put options that normally holds true: *An in-the-money put (stock is below strike) loses time value premium more quickly than an in-the-money call does.* Notice that with XYZ at 43 in Table 15-1, the put is 7 points in-the-money and has lost all its time value premium. But when the call is 7 points in-the-money, XYZ at 57, the call still has 2 points of time value premium. Again, this is a phenomenon that could be affected by the dividend payout of the underlying stock, but is true in general.

PRICING PUT OPTIONS

The same factors that determine the price of the call option also determine the price of the put option: price of the underlying stock, striking price of the option, time remaining until expiration, volatility of the underlying stock, dividend rate of the underlying stock, and the current risk-free interest rate (Treasury bill rate, for example). Market dynamics – supply, demand, and investor psychology – play a part as well.

Without going into as much detail as was shown in Chapter 1, the pricing curve of the put option can be developed. Certain facts remain true for the put option as they did for the call option. The rate of decay of the put option is not linear; that is, the time value premium will decay more rapidly in the weeks immediately preceding expiration. The more volatile the underlying stock, the higher will be the price

TABLE 15-1.
Call and put options compared.

XYZ Stock Price	XYZ July 50 Call Price	Call Intrinsic Value	Call Time Value Premium	XYZ July 50 Put Price	Put Intrinsic Value	Put Time Value Premium
40	1/2	0	1/2	9 3/4	10	–1/4*
43	1	0	1	7	7	0
45	2	0	2	6	5	1
47	3	0	3	5	3	2
50	5	0	5	4	0	4
53	7	3	4	3	0	3
55	8	5	3	2	0	2
57	9	7	2	1	0	1
60	10 1/2	10	1/2	1/2	0	1/2
70	19 3/4	20	–1/4*	1/4	0	1/4

*A deeply in-the-money option may actually trade at a discount from intrinsic value in advance of expiration.

of its options, both puts and calls. Moreover, the marketplace may at any time value options at a higher or lower volatility than the underlying stock actually exhibits. This is called implied volatility, as distinguished from actual volatility. Also, the put option is usually worth at least its intrinsic value at any time, and should be worth exactly its intrinsic value on the day that it expires. Figure 15-1 shows where one might expect the XYZ July 50 put to sell, for any stock price, if there are 6 months remaining until expiration. Compare this with the similar pricing curve for the call option (Figure 15-2). Note that the *intrinsic value line* for the put option faces in the opposite direction from the intrinsic value line for call options; that is, it gains value as the stock falls below the striking price. This put option pricing curve demonstrates the effect mentioned earlier, that a put option loses time value premium more quickly when it is in-the-money, and also shows that an out-of-the-money put holds a great deal of time value premium.

THE EFFECT OF DIVIDENDS ON PUT OPTION PREMIUMS

The dividend of the underlying stock is a negative factor on the price of its call options. The opposite is true for puts. *The larger the dividend, the more valuable the puts will be.* This is true because, as the stock goes ex-dividend, it will be reduced in

FIGURE 15-1.
Put option price curve.

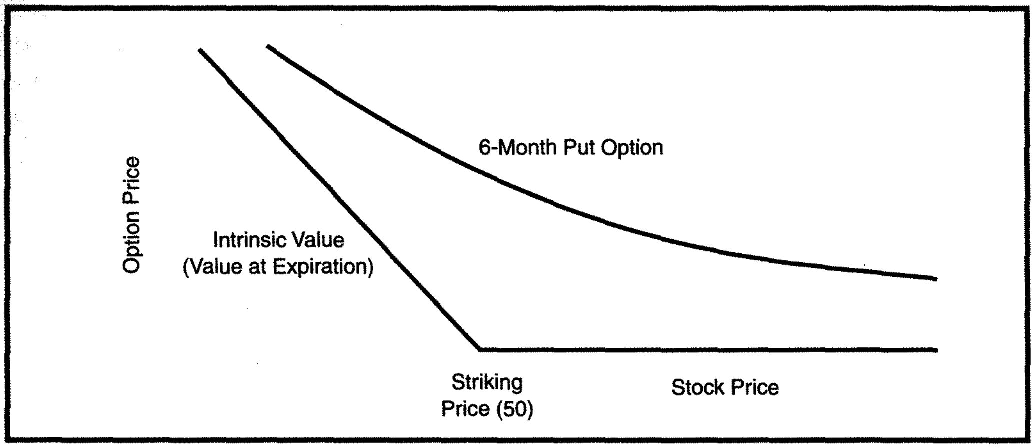
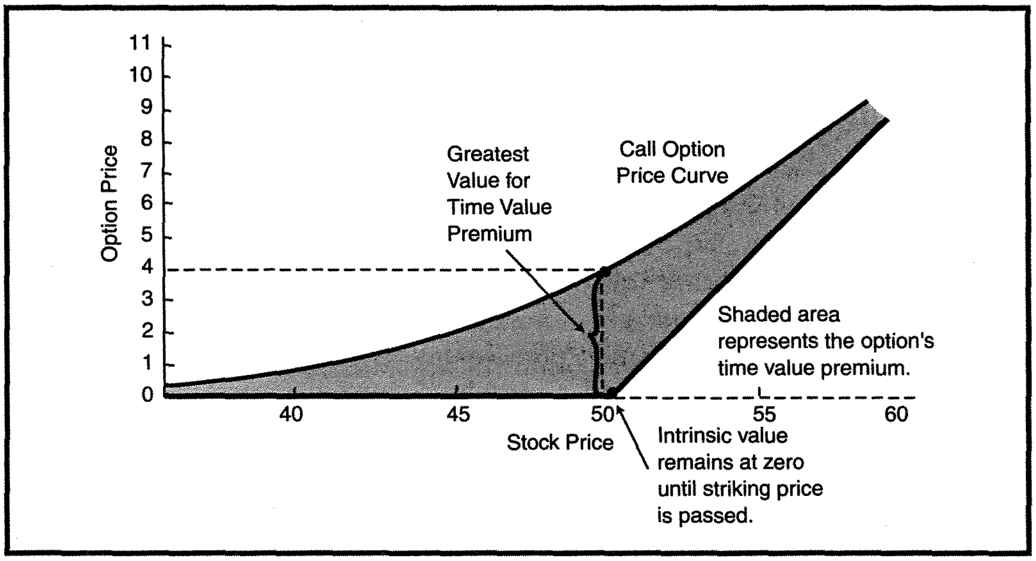


FIGURE 15-2.
Call option price curve.



price by the amount of the dividend. That is, the stock will decrease in price and therefore the put will become more valuable. Consequently, the buyer of the put will be willing to pay a higher price for the put and the seller of the put will also demand a higher price. As with listed calls, listed puts are not adjusted for the payment of cash dividends on the underlying stock. However, the price of the option itself will reflect the dividend payments on the stock.

Example: XYZ is selling for \$25 per share and will pay \$1 in dividends over the next 6 months. Then a 6-month put option with strike 25 should automatically be worth at least \$1, regardless of any other factor concerning the underlying stock. During the next 6 months, the stock will be reduced in price by the amount of its dividends – \$1 – and if everything else remained the same, the stock would then be at 24. With the stock at 24, the put would be 1 point in-the-money and would thus be worth at least its intrinsic value of 1 point. Thus, in advance, this large dividend payout of the underlying stock will help to increase the price of the put options on this stock.

On the day before a stock goes ex-dividend, the time value premium of an in-the-money put should be at least as large as the impending cash dividend payment. That is, if XYZ is 40 and is about to pay a \$.50 dividend, an XYZ January 50 put should sell for at least $10\frac{1}{2}$. This is true because the stock will be reduced in price by the amount of its dividend on the day of the ex-dividend.

EXERCISE AND ASSIGNMENT

When the holder of a put option exercises his option, he sells stock at the striking price. He may exercise this right at any time during the life of the put option. When this happens, *the writer of a put option with the same terms is assigned an obligation to buy stock at the striking price.* It is important to notice the difference between puts and calls in this case. The call holder exercises to buy stock and the call writer is obligated to sell stock. The reverse is true for the put holder and writer.

The methods of assignment via the OCC and the brokerage firm are the same for puts and calls; any fair method of random or first-in/first-out assignment is allowed. Stock commissions are charged on both the purchase and sale of the stock via the assignment and exercise.

When the holder of a put option exercises his right to sell stock, he may be selling stock that he currently holds in his portfolio. Second, he may simultaneously go into the open market and buy stock for sale via the put exercise. Finally, he may want to sell the stock in his short stock account; that is, he may short the underlying stock by exercising his put option. He would have to be able to borrow stock and supply the margin collateral for a short sale of stock if he chose this third course of action.

The writer of the put option also has several choices in how he wants to handle the stock purchase that he is required to make. *The put writer who is assigned must receive stock.* (The call writer who is assigned delivers stock.) The put writer may currently be short the underlying stock, in which case he will merely use the receipt of stock from the assignment to cover his short sale. He may also decide to immediate-

ly sell stock in the open market to offset the purchase that he is forced to make via the put assignment. Finally, he may decide to retain the stock that is delivered to him; he merely keeps the stock in his portfolio. He would, of course, have to pay for (or margin) the stock if he decides to keep it.

The mechanics as to how the put holder wants to deliver the stock and how the put writer wants to receive the stock are relatively simple. Each one merely notifies his brokerage firm of the way in which he wants to operate and, provided that he can meet the margin requirements, the exercise or assignment will be made in the desired manner.

ANTICIPATING ASSIGNMENT

The writer of a put option can anticipate assignment in the same way that the writer of a call can. *When the time value premium of an in-the-money put option disappears, there is a risk of assignment, regardless of the time remaining until expiration.* In Chapter 1, a form of arbitrage was described in which market-makers or firm traders, who pay little or no commissions, can take advantage of an in-the-money call selling at a discount to parity. Similarly, there is a method for these traders to take advantage of an in-the-money put selling at a discount to parity.

Example: XYZ is at 40 and an XYZ July 50 put is selling for 9¾ – a ¼ discount from parity. That is, the option is selling for ¼ point below its intrinsic value. The arbitrageur could take advantage of this situation through the following actions:

1. Buy the July put at 9¾.
2. Buy XYZ common stock at 40.
3. Exercise the put to sell XYZ at 50.

The arbitrageur makes 10 points on the stock portion of the transaction, buying the common at 40 and selling it at 50 via exercise of his put. He paid 9¾ for the put option and he loses this entire amount upon exercise. However, his overall profit is thus ¼ point, the amount of the original discount from parity. Since his commission costs are minimal, he can actually make a net profit on this transaction.

As was the case with deeply in-the-money calls, this type of arbitrage with deeply in-the-money puts provides a secondary market that might not otherwise exist. It allows the public holder of an in-the-money put to sell his option at a price near its intrinsic value. Without these arbitrageurs, there might not be a reasonable secondary market in which public put holders could liquidate.

Dividend payment dates may also have an effect on the frequency of assignment. For call options, the writer might expect to receive an assignment on the day the stock goes ex-dividend. The holder of the call is able to collect the dividend by so exercising. Things are slightly different for the writer of puts. He might expect to receive an assignment on the day after the ex-dividend date of the underlying stock. Since the writer of the put is obligated to buy stock, it is unlikely that anyone would put the stock to him until after the dividend has been paid. In any case, the writer of the put can use a relatively simple gauge to anticipate assignment near the ex-dividend date. If the time value premium of an in-the-money put is less than the amount of the dividend to be paid, the writer may often anticipate that he will be assigned immediately after the ex-dividend of the stock. An example will show why this is true.

Example: XYZ is at 45 and it will pay a $.50 dividend. Furthermore, the XYZ July 50 put is selling at 5¼. Note that the time value premium of the July 50 put is ¼ point – less than the amount of the dividend, which is ½ point. An arbitrageur could take the following actions:

1. Buy XYZ at 45.
2. Buy the July 50 put at 5¼.
3. Collect the ½-point dividend (he must hold the stock until the ex-date to collect the dividend).
4. Exercise his put to sell XYZ at 50 (writer would receive assignment on the day after the ex-date).

The arbitrageur makes 5 points on the stock trades, buying XYZ at 45 and selling it at 50 via exercise of the put. He also collects the ½-point dividend, making his total intake equal to 5½ points. He loses the 5¼ points that he paid for the put but still has a net profit of ¼ point. Thus, *as the ex-dividend date of a stock approaches, the time value premium of all in-the-money puts on that stock will tend to equal or exceed the amount of the dividend payment.*

This is quite different from the call option. It was shown in Chapter 1 that the call writer only needs to observe whether the call was trading at or below parity, regardless of the amount of the dividend, as the ex-dividend date approaches. The put writer must determine if the time value premium of the put exceeds the amount of the dividend to be paid. If it does, there is a much smaller chance of assignment because of the dividend. In any case, the put writer can anticipate the assignment if he carefully monitors his position.

POSITION LIMITS

Recall that the position limit rule states that one cannot have a position of more than the limit of options on the same side of the market in the same underlying security. The limit varies depending on the trading activity and volatility of the underlying stock and is set by the exchange on which the options are traded. The actual limits are 13,500, 22,500, 31,500, 60,000, or 75,000 contracts, depending on these factors. One cannot have more than 75,000 option contracts on the bullish side of the market – long calls and/or short puts – nor can he have more than 75,000 contracts on the bearish side of the market – short calls and/or long puts. He may, however, have 75,000 contracts on each side of the market; he could simultaneously be long 75,000 calls and long 75,000 puts.

For the following examples, assume that one is concerned with an underlying stock whose position limit is 75,000 contracts.

Long 75,000 calls, long 75,000 puts – no violation; 75,000 contracts bullish (long calls) and 75,000 contracts bearish (long puts).

Long 38,000 calls, short 37,000 puts – no violation; total of 75,000 contracts bullish.

Long 38,000 calls, short 38,000 puts – violation; total of 76,000 contracts bullish.

Money managers should be aware that these position limits apply to all "related" accounts, so that someone managing several accounts must total all the accounts' positions when considering the position limit rule.

CONVERSION

Many of the relationships between call prices and put prices relate to a process known as a *conversion.* This term dates back to the over-the-counter option days when a dealer who owned a put (or could buy one) was able to satisfy the needs of a potential call buyer by "converting" the put to a call. This terminology is somewhat confusing, and the actual position that the dealer would take is little more than an arbitrage position. In the listed market, arbitrageurs and firm traders can set up the same position that the converter did.

The actual details of the conversion process, which must include the carrying cost of owning stock and the inclusion of all dividends to be paid by the stock during the time the position is held, are described later. However, it is important for the put option trader to understand what the arbitrageur is attempting to do in order for him to fully understand the relationship between put and call prices in the listed option market.

A conversion position has no risk. The arbitrageur will do three things:

1. Buy 100 shares of the underlying stock.
2. Buy 1 put option at a certain striking price.
3. Sell 1 call option at the same striking price.

The arbitrageur has no risk in this position. If the underlying stock drops, he can always exercise his long put to sell the stock at a higher price. If the underlying stock rises, his long stock offsets the loss on his short call. Of course, the prices that the arbitrageur pays for the individual securities determine whether or not a conversion will be profitable. At times, a public customer may look at prices in the newspaper and see that he could establish a position similar to the foregoing one for a profit, even after commissions. However, unless prices are out of line, the public customer would not normally be able to make a better return than he could by putting his money into a bank or a Treasury bill, because of the commission costs he would pay.

Without needing to understand, at this time, exactly what prices would make an attractive conversion, it is possible to see that it would not always be possible for the arbitrageur to do a conversion. The mere action of many arbitrageurs doing the same conversion would force the prices into line. The stock price would rise because arbitrageurs are buying the stock, as would the put price; and the call price would drop because of the preponderance of sellers.

When this happens, another arbitrage, known as a *reversal (or reverse conversion),* is possible. In this case, the arbitrageur does the opposite: He shorts the underlying stock, sells 1 put, and buys 1 call. Again, this is a position with no risk. If the stock rises, he can always exercise his call to buy stock at a lower price and cover his short sale. If the stock falls, his short stock will offset any losses on his short put.

The point of introducing this information, which is relatively complicated, at this place in the text is to demonstrate that *there is a relationship between put and call prices, when both have the same striking price and expiration date.* They are not independent of one another. If the put becomes "cheap" with respect to the call, arbitrageurs will move in to do conversions and force the prices back in line. On the other hand, if the put becomes expensive with relationship to the call, arbitrageurs will do reversals until the prices move back into line.

Because of the way in which the carrying cost of the stock and the dividend rate of the stock are involved in doing these conversions or reversals, two facts come to light regarding the relationship of put prices and call prices. Both of these facts have to do with the carrying costs incurred during the conversion. First, *a put option will generally sell for less than a call option when the underlying stock is exactly at the striking price,* unless the stock pays a large dividend. In the older over-the-counter

option market, it was often stated that the reason for this relationship was that the demand for calls was larger than the demand for puts. This may have been partially true, but certainly it is no longer true in the listed option targets, where a large supply of both listed puts and calls is available through the OCC. Arbitrageurs again serve a useful function in increasing supply and demand where it might not otherwise exist. The second fact concerning the relationship of puts and calls is that a *put option will lose its time value premium much more quickly in-the-money than a call option will* (and, conversely, a put option will generally hold out-of-the-money time value premium better than a call option will). Again, the conversion and reversal processes play a large role in this price action phenomenon of puts and calls. Both of these facts have to do with the carrying costs involved in the conversion.

In the chapter on Arbitrage, exact details of conversions and reversals will be spelled out, with specific reasons why these procedures affect the relationship of put and call prices as stated above. However, at this time, it is sufficient for the reader to understand that there is an arbitrage process that is quite widely practiced that will, in fact, make true the foregoing relationships between puts and calls.

CHAPTER 16

Put Option Buying

The purchase of a put option provides leverage in the case of a downward move by the underlying stock. In this manner, *it is an alternative to the short sale of stock,* much as the purchase of a call option is a leveraged alternative to the purchase of stock.

PUT BUYING VERSUS SHORT SALE

In the simplest case, when an investor expects a stock to decline in price, he may either short the underlying stock or buy a put option on the stock. Suppose that XYZ is at 50 and that an XYZ July 50 put option is trading at 5. If the underlying stock declines substantially, *the buyer of the put could make profits considerably in excess of his initial investment.* However, if the underlying stock rises in price, *the put buyer has limited risk;* he can lose only the amount of money that he originally paid for the put option. In this example, the most that the put buyer could lose would be 5 points, which is equal to his entire initial investment. Table 16-1 and Figure 16-1 depict the results, at expiration, of this simple purchase of the put option.

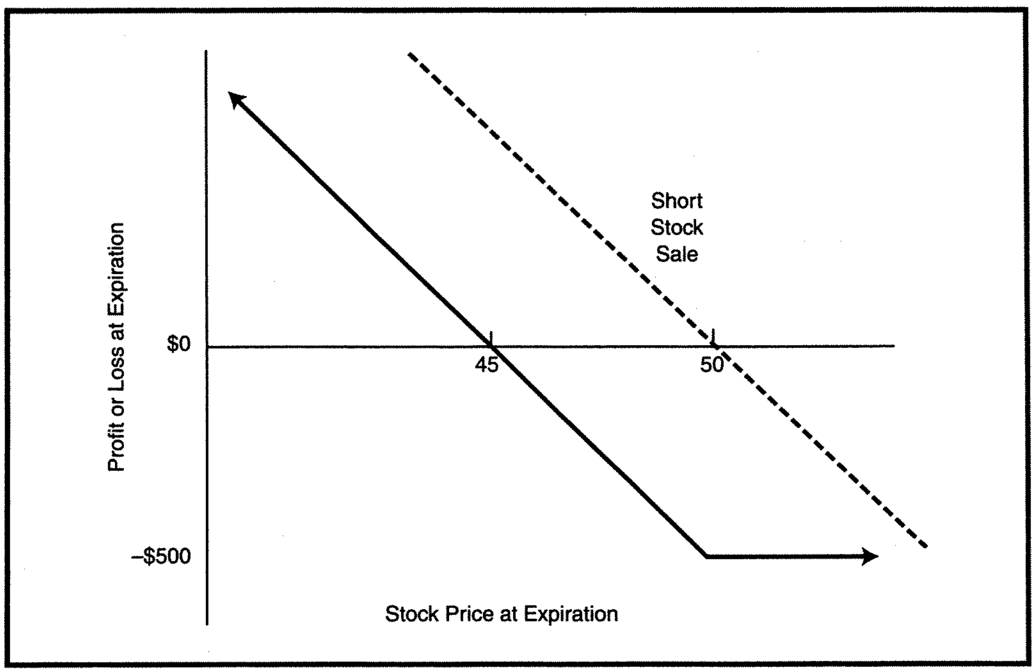
The put buyer has limited profit potential, since a stock can never drop in price below zero dollars per share. However, his potential profits can be huge, percentagewise. His loss, which normally would occur if the stock rises in price, is limited to the amount of his initial investment. *The simplest use of a put purchase is for speculative purposes when expecting a price decline in the underlying stock.*

These results for the profit or loss of the put option purchases can be compared to a similar short sale of XYZ at 50 in order to observe the benefits of leverage and limited risk that the put option buyer achieves. In order to sell short 100 XYZ at 50, assume that the trader would have to use $2,500 in margin. Several points can be ver-

TABLE 16-1.
Results of put purchase at expiration.

XYZ Price at Expiration	Put Price at Expiration	Put Option Profit
20	30	+$2,500
30	20	+ 1,500
40	10	+ 500
45	5	0
48	2	– 300
50	0	– 500
60	0	– 500
70	0	– 500

FIGURE 16-1.
Put option purchase.



ified from Table 16-2 and Figure 16-1. If the stock drops in price sufficiently far, the percentage profits are much greater on the put option purchase than they are on the short sale of the underlying stock. This is the leveraging effect that an option pur-

chase can achieve. If the underlying stock remains relatively unchanged, the short seller would do better because he does not risk losing his entire investment in a limited amount of time if the underlying stock changes only slightly in price. However, if the underlying stock should rise dramatically, the short seller can actually lose more than his initial investment. The short sale of stock has theoretically unlimited risk. Such is not true of the put option purchase, whereby the risk is limited to the amount of the initial investment. One other point should be made when comparing the purchase of a put and the short sale of stock: The short seller of stock is obligated to pay the dividends on the stock, but the put option holder has no such obligation. This is an additional advantage to the holder of the put.

TABLE 16-2.
Results of selling short.

XYZ Price at Expiration	Short Sale	Put Option Purchase
20	+ $3,000 (+ 120%)	+$2,500 (+ 500%)
30	+ 2,000 (+ 80%)	+ 1,500 (+ 300%)
40	+ 1,000 (+ 40%)	+ 500 (+ 100%)
45	+ 500 (+ 20%)	0 (0%)
48	+ 200 (+ 80%)	– 300 (– 60%)
50	0 (0%)	– 500 (– 100%)
60	– 1,000 (– 40%)	– 500 (– 100%)
75	– 2,500 (– 100%)	– 500 (– 100%)
100	– 5,000 (– 200%)	– 500 (– 100%)

SELECTING WHICH PUT TO BUY

Many of the same types of analyses that the call buyer goes through in deciding which call to buy can be used by the prospective put buyer as well. First, when approaching put buying as a speculative strategy, one should not place more than 15% of his risk capital in the strategy. Some investors participate in put buying to add some amount of downside protection to their basically bullishly-oriented common stock portfolios. More is said in Chapter 17 about buying puts on stocks that one actually owns.

The out-of-the-money put offers both higher reward potentials and higher risk potentials than does the in-the-money put. If the underlying stock drops substantial-

ly, the percentage returns from having purchased a cheaper, out-of-the-money put will be greater. However, should the underlying stock decline only moderately in price, the *in-the-money put* will often prove to be the better choice. In fact, since a put option tends to lose its time value premium quickly as it becomes an in-the-money option, there is an even greater advantage to the purchase of the in-the-money put.

Example: XYZ is at 49 and the following prices exist:

XYZ, 49;
XYZ July 45 put, 1; and
XYZ July 50 put, 3.

If the underlying stock were to drop to 40 by expiration, the July 45 put would be worth 5 points, a 400% profit. The July 50 put would be worth 10 points, a 233% profit over its initial purchase price of 3. Thus, in a substantial downward move, the out-of-the-money put purchase provides higher reward potential. However, if the underlying stock drops only moderately, say to 45, the purchaser of the July 45 put would lose his entire investment, since the put would be worthless at expiration. The purchaser of the in-the-money July 50 put would have a 2-point profit with XYZ at 45 at expiration.

The preceding analysis is based on holding the put until expiration. For the option buyer, this is generally an erroneous form of analysis, because the buyer generally tends to liquidate his option purchase in advance of expiration. When considering what happens to the put option in advance of expiration, it is helpful to remember that an in-the-money put tends to lose its time premium rather quickly. In the example above, the July 45 put is completely composed of time value premium. If the underlying stock begins to drop below 45, the price of the put will not increase as rapidly as would the price of a call that is going into-the-money.

Example: If XYZ fell by 5 points to 44, definitely a move in the put buyer's favor, he may find that the July 45 put has increased in value only to 2 or 2½ points. This is somewhat disappointing because, with call options, one would expect to do significantly better on a 5-point stock movement in his favor. Thus, when purchasing put options for speculation, *it is generally best to concentrate on in-the-money puts unless a very substantial decline in the price of the underlying stock is anticipated.*

Once the put option is in-the-money, the time value premium will decrease even in the longer-term series. Since this time premium is small in all series, the put

buyer can often purchase a longer-term option for very little extra money, thus gaining more time to work with. Call option buyers are generally forced to avoid the longer-term series because the extra cost is not worth the risk involved, especially in a trading situation. However, the put buyer does not necessarily have this disadvantage. If he can purchase the longer-term put for nearly the same price as the near-term put, he should do so in case the underlying stock takes longer to drop than he had originally anticipated it would.

It is not uncommon to see such prices as the following:

XYZ common, 46:

XYZ April 50 put, 4;

XYZ July 50 put, $4\frac{1}{2}$; and

XYZ October 50 put, 5.

None of these three puts have much time value premium in their prices. Thus, the buyer might be willing to spend the extra 1 point and buy the longest-term put. If the underlying stock should drop in price immediately, he will profit, but not as much as if he had bought one of the less expensive puts. However, should the underlying stock rise in price, he will own the longest-term put and will therefore suffer less of a loss, percentagewise. If the underlying stock rises in price, some amount of time value premium will come back into the various puts, and the longest-term put will have the largest amount of time premium. For example, if the stock rises back to 50, the following prices might exist:

XYZ common, 50;

XYZ April 50 put, 1;

XYZ July 50 put, $2\frac{1}{2}$; and

XYZ October 50 put, $3\frac{1}{2}$.

The purchase of the longer-term October 50 put would have suffered the least loss, percentagewise, in this event. Consequently, when one is purchasing an in-the-money put, he may often want to consider buying the longest-term put if the time value premium is small when compared to the time premium in the nearer-term puts.

In Chapter 3, the delta of an option was described as the amount by which one might expect the option will increase or decrease in price if the underlying stock moves by a fixed amount (generally considered to be one point, for simplicity). Thus, if XYZ is at 49 and a call option is priced at 3 with a delta of $\frac{1}{2}$, one would expect the call to sell for $3\frac{1}{2}$ with XYZ at 50 and to sell at $2\frac{1}{2}$ with XYZ at 48. In reality, the delta

changes even on a fractional move in the underlying stock, but one generally assumes that it will hold true for a 1-point move. Obviously, put options have deltas as well. The delta of a put is a negative number, reflecting the fact that the put price and the stock price are inversely related. *As an approximation, one could say that the delta of the call option minus the delta of the put option with the same terms is equal to 1.* That is,

$$\text{Delta of put} = \text{Delta of call} - 1.$$

This is an approximation and is accurate unless the put is deeply in-the-money. It has already been pointed out that the time value premium behavior of puts and calls is different, so it is inaccurate to assume that this formula holds true exactly for all cases.

The delta of a put ranges between 0 and minus 1. If a July 50 put has a delta of $-1/2$, and the underlying stock *rises* by 1 point, the put will lose $1/2$ point. The delta of a deeply out-of-the-money put is close to zero. The put's delta would decrease slowly at first as the stock declined in value, then would begin to decrease much more rapidly as the stock fell through the striking price, and would reach a value of minus 1 (the minimum) as the stock fell only moderately below the striking price. This is reflective of the fact that an out-of-the-money put tends to hold time premium quite well and an in-the-money put comes to parity rather quickly.

RANKING PROSPECTIVE PUT PURCHASES

In Chapter 3, a method of ranking prospective call purchases was developed that encompassed certain factors, such as the volatility of the underlying stock and the expected holding period of the purchased option. The same sort of analysis should be applied to put option purchases.

The steps are summarized below. The reader may refer to the section titled "Advanced Selection Criteria" in Chapter 3 for a more detailed description of why this method of ranking is superior.

1. Assume that each underlying stock can decrease in price in accordance with its volatility over a fixed holding period (30, 60, or 90 days).
2. Estimate the put option prices after the decrease.
3. Rank all potential put purchases by the highest reward opportunity for aggressive purchases.
4. Estimate how much would be lost if the underlying stock instead rose in accordance with its volatility, and rank all potential put purchases by best risk/reward ratio for a more conservative list of put purchases.

As was stated earlier, it is necessary to have a computer to make an accurate analysis of all listed options. The average customer is forced to obtain such data from a brokerage firm or data service. He should be sure that the list he is using conforms to the above-mentioned criteria. If the data service is ranking option purchases by how well the puts would do if each underlying stock fell by a fixed percentage (such as 5% or 10%), the list should be rejected because it is not incorporating the volatility of the underlying stock into its analysis. Also, if the list is based on holding the put purchase until expiration, the list should be rejected as well, because this is not a realistic assumption. There are enough reliable and sophisticated data services that one should not have to work with inferior analyses in today's option market.

For those readers who are more mathematically advanced and have the computer capability to construct their own analyses, the details of implementing an analysis similar to the one described above are presented in Chapter 28, Mathematical Applications. An application of put purchases, combined with fixed-income securities, is described in Chapter 26, Buying Options and Treasury Bills.

FOLLOW-UP ACTION

The put buyer can take advantage of strategies that are very similar to those the call buyer uses for follow-up action, either to lock in profits or to attempt to improve a losing situation. Before discussing these specific strategies, it should be stated again that it is rarely to the option buyer's benefit to exercise the option in order to liquidate. This precludes, of course, those situations in which the call buyer actually wants to own the stock or the put buyer actually wants to sell the stock. If, however, the option holder is merely looking to liquidate his position, the cost of stock commissions makes exercising a prohibitive move. This is true even if he has to accept a price that is a slight discount from parity when he sells his option.

LOCKING IN PROFITS

The reader may recall that there were four strategies (perhaps "tactics" is a better word) for the call buyer with an unrealized profit. These same four tactics can be used with only slight variations by the put option buyer. Additionally, a fifth strategy can be employed when a stock has both listed puts and calls.

After an underlying stock has moved down and the put buyer has a relatively substantial unrealized gain, he might consider taking one of the following actions:

1. Sell the put and liquidate the position for a profit.
2. Do nothing and continue to hold the put.

3. Sell the in-the-money long put and use part of the proceeds to purchase out-of-the-money puts.
4. Create a spread by selling an out-of-the-money put against the one he currently holds.

These are the same four tactics that were discussed earlier with respect to call buying. In the fifth tactic, the holder of a listed put who has an unrealized profit might consider buying a listed *call* to protect his position.

Example: A speculator originally purchased an XYZ October 50 put for 2 points when the stock was 52. If the stock has now fallen to 45, the put might be worth 6 points, representing an unrealized gain of 4 points and placing the put buyer in a position to implement one of these five tactics. After some time has passed, with the stock at 45, an at-the-money October 45 put might be selling for 2 points. Table 16-3 summarizes the situation. If the trader merely liquidates his position by selling out the October 50 put, he would realize a profit of 4 points. Since he is terminating the position, he can make neither more nor less than 4 points. This is the most conservative of the tactics, allowing no additional room for appreciation, but also eliminating any chance of losing the accumulated profits.

TABLE 16-3.
Background table for profit alternatives.

Original Trade	Current Prices	
XYZ common: 52	XYZ common:	45
Bought XYZ October 50 put at 2	XYZ October 50 put:	6
	XYZ October 45 put:	2

If the trader does nothing, merely continuing to hold the October 50 put, he is taking an aggressive action. If the stock should reverse and rise back above 50 by expiration, he would lose everything. However, if the stock continues to fall, he could build up substantially larger profits. This is the only tactic that could eventually result in a loss at expiration.

These two simple strategies – liquidating or doing nothing – are the easiest alternatives. The remaining strategies allow one to attempt to achieve a balance between retaining built-up profits and generating even more profits. The third tactic that the speculator could use would be to sell the put that he is currently holding and

use some of the proceeds to purchase the October 45 put. *The general idea in this tactic is to pull one's initial investment out of the market* and then to increase the number of option contracts held by buying the out-of-the-money option.

Example: The trader would receive 6 points from the sale of the October 50 put. He should take 2 points of this amount and put it back into his pocket, thus covering his initial investment. Then he could buy 2 October 45 puts at 2 points each with the remaining portion of the proceeds from the sale. He has no risk at expiration with this strategy, since he has recovered his initial investment. Moreover, if the underlying stock should continue to fall rapidly, he could profit handsomely because he has increased the number of put contracts that he holds.

The fourth choice that the put holder has is to create a spread by selling the October 45 put against the October 50 that he currently holds. This would create a bear spread, technically. This type of spread is described in more detail later. For the time being, it is sufficient to understand what happens to the trader's risks and rewards by creating this spread. The sale of the October 45 put brings in 2 points, which covers the initial 2-point purchase cost of the October 50 put. Thus, *his "cost" for this spread is nothing;* he has no risk, except for commissions. If the underlying stock should rise above 50 by expiration, all the puts would expire worthless. (A put expires worthless when the underlying stock is above the striking price at expiration.) This would represent the worst case; he would recover nothing from the spread. If the stock should be below 45 at expiration, he would realize the maximum potential of the spread, which is 5 points. That is, no matter how far XYZ is below 45 at expiration, the October 50 put will be worth 5 points more than the October 45 put, and the spread could thus be liquidated for 5 points. His maximum profit potential in the spread situation is 5 points. This tactic would be the best one if the underlying stock stabilized near 45 until expiration.

To analyze the fifth strategy that the put holder could use, it is necessary to introduce a call option into the picture.

Example: With XYZ at 45, there is an October 45 call selling for 3 points. The put holder could buy this call in order to limit his risk and still retain the potential for large future profits. If the trader buys the call, he will have the following position:

Long 1 October 50 put
Long 1 October 45 call – Combined cost: 5 points

The total combined cost of this put and call combination is 5 points – 2 points were originally paid for the put, and now 3 points have been paid for the call. No matter where the underlying stock is at expiration, this combination will be worth at least 5

points. For example, if XYZ is at 46 at expiration, the put will be worth 4 and the call worth 1; or if XYZ is at 48, the put will be worth 2 and the call worth 3. If the stock is above 50 or below 45 at expiration, the combination will be worth more than 5 points. Thus, the trader has no risk in this combination, since he has paid 5 points for it and will be able to sell it for at least 5 points at expiration. In fact, if the underlying stock continues to drop, the put will become more valuable and he could build up substantial profits. Moreover, if the underlying stock should reverse direction and climb substantially, he could still profit, because the call will then become valuable. This tactic is the best one to use if the underlying stock does not stabilize near 45, but instead makes a relatively dramatic move either up or down by expiration. The strategy of simultaneously owning both a put and a call is discussed in much greater detail in Chapter 23. It is introduced here merely for the purposes of the put buyer wanting to obtain protection of his unrealized profits.

Each of these five strategies may work out to be the best one under a different set of circumstances. The ultimate result of each tactic is dependent on the direction that XYZ moves in the future. As was the case with call options, *the spread tactic never turns out to be the worst tactic,* although it is the best one only if the underlying stock stabilizes. Tables 16-4 and 16-5 summarize the results the speculator could expect from invoking each of these five tactics. The tactics are:

1. Liquidate – sell the long put for a profit and do not reinvest.
2. Do nothing – continue to hold the long put.
3. "Roll down" – sell the long put, pocket the initial investment, and invest the remaining proceeds in out-of-the-money puts at a lower strike.
4. "Spread" – create a spread by selling the out-of-the-money put against the put already held.
5. "Combine" – create a combination by buying a call at a lower strike while continuing to hold the put.

TABLE 16-4.
Comparison of the five tactics.

By expiration, if XYZ...	the best strategy was...	and the worst strategy was...
Continues to fall dramatically	"Roll down"	Liquidate
Falls moderately further	Do nothing	Combine
Remains relatively unchanged	Spread	Combine or "roll down"
Rises moderately	Liquidate	"Roll down" or do nothing
Rises substantially	Combine	Do nothing

TABLE 16-5.
Results of adopting each of the five tactics.

XYZ Price at Expiration	"Roll Down" Profit	Do-Nothing Profit	Spread Profit	Liquidate Profit	Combine Profit
30	+ $3,000 (B)	+$1,800	+$500	+$400 (W)	+$1,500
35	+ 2,000 (B)	+ 1,300	+ 500	+ 400 (W)	+ 1,000
41	+ 800 (B)	+ 700	+ 500	+ 400 (W)	+ 400
42	+ 600 (B)	+ 600 (B)	+ 500	+ 400	+ 300 (W)
43	+ 400	+ 500 (B)	+ 500 (B)	+ 400	+ 200 (W)
45	0 (W)	+ 300	+ 500 (B)	+ 400	0 (W)
46	0 (W)	+ 200	+ 400 (B)	+ 400 (B)	0 (W)
48	0 (W)	0 (W)	+ 200	+ 400 (B)	0 (W)
50	0	– 200 (W)	0	+ 400 (B)	0
54	0	– 200 (W)	0	+ 400 (B)	+ 400 (B)
60	0	– 200 (W)	0	+ 400	+ 1,000 (B)

Note that each tactic is the best one under one of the scenarios, but that the spread tactic is never the worst of the five. The actual results of each tactic, using the figures from the example above, are depicted in Table 16-5, where B denotes best tactic and W denotes worst one.

All the strategies are profitable if the underlying stock continues to fall dramatically, although the "roll down," "do nothing," and combinations work out best, because they continue to accrue profits if the stock continues to fall. If the underlying stock rises instead, only the combination outdistances the simplest tactic of all, liquidation.

If the underlying stock stabilizes, the "do-nothing" and "spread" tactics work out best. It would generally appear that the combination tactic or the "roll-down" tactic would be the most attractive, since neither one has any risk and both could generate large profits if the stock moved substantially. The advantage for the spread was substantial in call options, but in the case of puts, the premium received for the out-of-the-money put is not as large, and therefore the spread strategy loses some of its attractiveness. Finally, any of these tactics could be applied partially; for example, one could sell out half of a profitable long position in order to take some profits, and continue to hold the remainder.

LOSS-LIMITING ACTIONS

The foregoing discussion concentrated on how the put holder could retain or increase his profit. However, it is often the case in option buying that the holder of the option is faced with an unrealized loss. The put holder may also have several choices of action to take in this case. His first, and simplest, course of action would be to sell the put and take his loss. Although this is advisable in certain cases, especially when the underlying stock seems to have assumed a distinctly bullish stance, it is not always the wisest thing to do. The put holder who has a loss may also consider either "rolling up" to create a bearish spread or entering into a calendar spread. Either of these actions could help him recover part or all of his loss.

THE "ROLLING-UP" STRATEGY

The reader may recall that a similar action to "rolling up," termed "rolling down," was available for call options held at a loss and was described in Chapter 3. The put buyer who owns a put at a loss may be able to create a spread that allows him to break even at a more favorable price at expiration. Such action will inevitably limit his profit potential, but is generally useful in recovering something from a put that might otherwise expire totally worthless.

Example: An investor initially purchases an XYZ October 45 put for 3 points when the underlying stock is at 45. However, the stock rises to 48 at a later date and the put that was originally bought for 3 points is now selling for 1½ points. It is not unusual, by the way, for a put to retain this much of its value even though the stock has moved up and some amount of time has passed, since out-of-the-money puts tend to hold time value premium rather well. With XYZ at 48, an October 50 put might be selling for 3 points. The put holder could create a position designed to permit recovery of some of his losses by *selling two of the puts that he is long – October 45's – and simultaneously buying one October 50 put.* The net cost for this transaction would be only commissions, since he receives $300 from selling two puts at 1½ each, which completely covers the $300 cost of buying the October 50 put. The transactions are summarized in Table 16-6.

By selling 2 of the October 45 puts, the investor is now short an October 45 put. Since he also purchased an October 50 put, he has a spread (technically, a bear spread). He has spent no additional money, except commissions, to set up this spread, since the sale of the October 45's covered the purchase of the October 50 put. *This strategy is most attractive when the debit involved to create the spread is small.* In this example, the debit is zero.

TABLE 16-6.
Summary of rolling-up transactions.

Original trade:	Buy 1 October 45 put for 3 with XYZ at 45	\$300 debit
Later:	With XYZ at 48, sell 2 October 45's for $1\frac{1}{2}$ each	\$300 credit
	and buy 1 October 50 put for 3	\$300 debit
Net position:	Long 1 October 50 put Short 1 October 45 put	\$300 debit

The effect of creating this spread is that *the investor has not increased his risk at all, but has raised the break-even point for his position.* That is, if XYZ merely falls a small distance, he will be able to get out even. Without the effect of creating the spread, the put holder would need XYZ to fall back to 42 at expiration in order for him to break even, since he originally paid 3 points for the October 45 put. His original risk was \$300. If XYZ continues to rise in price and the puts in the spread expire worthless, the net loss will still be only \$300 plus additional commissions. Admittedly, the commissions for the spread will increase the loss slightly, but they are small in comparison to the debit of the position (\$300). On the other hand, if the stock should fall back only slightly, to 47 by expiration, the spread will break even. At expiration, with XYZ at 47, the in-the-money October 50 put will be worth 3 points and the out-of-the-money October 45 put will expire worthless. Thus, the investor will recover his \$300 cost, except for commissions, with XYZ at 47 at expiration. His break-even point is raised from 42 to 47, a substantial improvement of his chances for recovery.

The implementation of this spread strategy reduces the profit potential of the position, however. The maximum potential of the spread is 2 points. If XYZ is anywhere below 45 at expiration, the spread will be worth 5 points, since the October 50 put will sell for 5 points more than the October 45 put. The investor has limited his potential profit to 2 points – the 5-point maximum width of the spread, less the 3 points that he paid to get into the position. He can no longer gain substantially on a large drop in price by the underlying stock. This is normally of little concern to the put holder faced with an unrealized loss and the potential for a total loss. He generally would be appreciative of getting out even or of making a small profit. The creation of the spread accomplishes this objective for him.

It should also be pointed out that he does not incur the maximum loss of his entire debit plus commissions, unless XYZ closes above 50 at expiration. If XYZ is

anywhere below 50, the October 50 will have some value and the investor will be able to recover something from the position. This is distinctly different from the original put holding of the October 45, whereby the maximum loss would be incurred unless the stock were below 45 at expiration. *Thus, the introduction of the spread also reduces the chances of having to realize the maximum loss.*

In summary, the put holder faced with an unrealized loss may be able to create a spread by selling twice the number of puts that he is currently long and simultaneously buying the put at the next higher strike. This action should be used only if the spread can be transacted at a small debit or, preferably, at even money (zero debit). The spread position offers a much better chance of breaking even and also reduces the possibility of having to realize the maximum loss in the position. However, the introduction of these loss-limiting measures reduces the maximum potential of the position if the underlying stock should subsequently decline in price by a significant amount. Using this spread strategy for puts would require a margin account, just as calls do.

THE CALENDAR SPREAD STRATEGY

Another strategy is sometimes available to the put holder who has an unrealized loss. If the put that he is holding has an intermediate-term or long-term expiration date, he might be able to create a *calendar spread* by selling the near-term put against the put that he currently holds.

Example: An investor bought an XYZ October 45 put for 3 points when the stock was at 45. The stock rises to 48, moving in the wrong direction for the put buyer, and his put falls in value to 1½. He might, at that time, consider selling the near-term July 45 put for 1 point. The ideal situation would be for the July 45 put to expire worthless, reducing the cost of his long put by 1 point. Then, if the underlying stock declined below 45, he could profit after July expiration.

The major drawback to this strategy is that little or no profit will be made – in fact, a loss is quite possible – if the underlying stock falls back to 45 or below before the near-term July option expires. Puts display different qualities in their time value premiums than calls do, as has been noted before. With the stock at 45, the differential between the July 45 put and the October 45 put might not widen much at all. This would mean that the spread has not gained anything, and the spreader has a loss equal to his commissions plus the initial unrealized loss. In the example above, if XYZ dropped quickly back to 45, the July 45 might be worth 1½ and the October worth 2½. At this point, the spreader would have a loss on both sides of his spread: He sold the July 45 put for 1 and it is now 1½; he bought the October 45 for 3 and it is now

$2\frac{1}{2}$; plus he has spent two commissions to date and would have to spend two more to liquidate the position.

At this point, the strategist may decide to do nothing and take his chances that the stock will subsequently rally so that the July 45 put will expire worthless. However, if the stock continues to decline below 45, the spread will most certainly become more of a loss as both puts come closer to parity.

This type of spread strategy is not as attractive as the "rolling-up" strategy. In the "rolling-up" strategy, one is not subjected to a loss if the stock declines after the spread is established, although he does limit his profits. The fact that the calendar spread strategy can lead to a loss even if the stock declines makes it a less desirable alternative.

EQUIVALENT POSITIONS

Before considering other put-oriented strategies, the reader should understand the definition of an equivalent position. Two strategies, or positions, are equivalent when they have the same profit potential. They may have different collateral or investment requirements, but they have similar profit potentials. Many of the call-oriented strategies that were discussed in Part II of the book have an equivalent put strategy. One such case has already been described: The "protected short sale," or shorting the common stock and buying a call, is equivalent to the purchase of a put. That is, both have a limited risk above the striking price of the option and relatively large profit potential to the downside. *An easy way to tell if two strategies are equivalent is to see if their profit graphs have the same shape.* The put purchase and the "protected short sale" have profit graphs with exactly the same shape (Figures 16-1 and 4-1, respectively). As more put strategies are discussed, it will always be mentioned if the put strategy is equivalent to a previously described call strategy. This may help to clarify the put strategies, which understandably may seem complex to the reader who is not familiar with put options.

CHAPTER 17

Put Buying in Conjunction with Common Stock Ownership

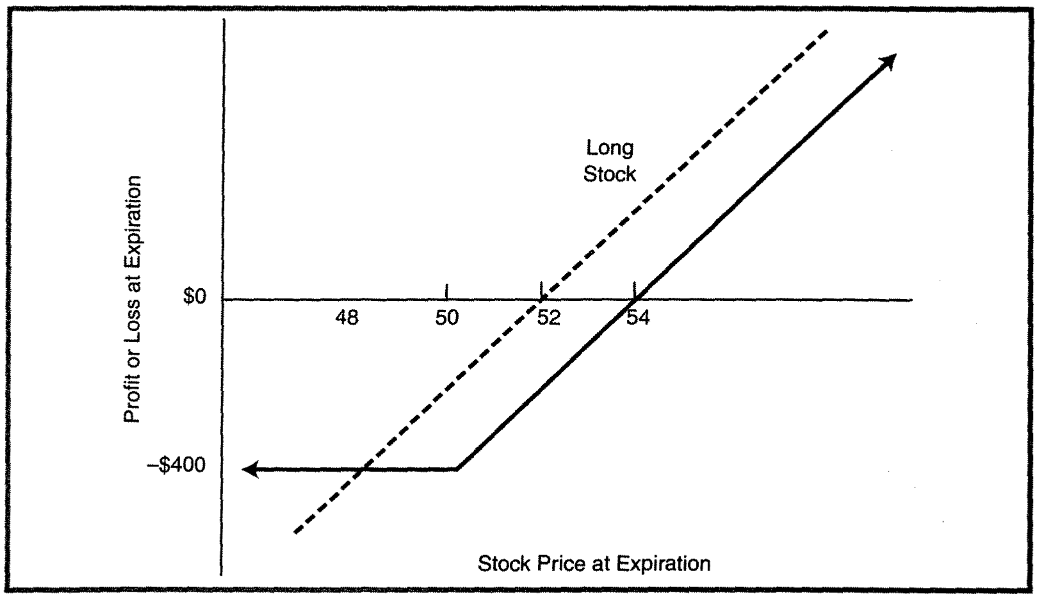
Another useful feature of put options, in addition to their speculative leverage in a downward move by the underlying stock, is that *the put purchase can be used to limit downside loss in a stock that is owned.* When one simultaneously owns both the common stock and a put on that same stock, he has a position with limited downside risk during the life of the put. This position is also called a synthetic long call, because the profit graph is the same shape as a long call's.

Example: An investor owns XYZ stock, which is at 52, and purchases an XYZ October 50 put for 2. The put gives him the right to *sell* XYZ at 50, so the most that the stockholder can lose on his stock is 2 points. Since he pays 2 points for the put protection, his maximum potential loss until October expiration is 4 points, no matter how far XYZ might decline up until that time. If, on the other hand, the price of the stock should move up by October, the investor would realize any gain in the stock, less the 2 points that he paid for the put protection. *The put functions much like an insurance policy with a finite life.* Table 17-1 and Figure 17-1 depict the results at October expiration for this position: buying the October 50 put for 2 points to protect a holding in XYZ common stock, which is selling at 52. The dashed line on the graph represents the profit potential of the common stock ownership by itself. Notice that if the stock were below 48 in October, the common stock owner would have been better off buying the put. However, with XYZ above 48 at expiration, the put purchase was a burden that cost a small portion of potential profits. This strategy, however, is not necessarily geared to maximizing

TABLE 17-1.
Results at expiration on a protected stock holding.

XYZ Price at Expiration	Stock Profit	Put Profit	Total Profit
30	-$2,200	+$1,800	-$ 400
40	- 1,200	+ 800	- 400
50	- 200	- 200	- 400
54	+ 200	- 200	0
60	+ 800	- 200	+ 600
70	+ 1,800	- 200	+ 1,600
80	+ 2,800	- 200	+ 2,600

FIGURE 17-1.
Long common stock and long put.



one's profit potential on the common stock, but rather provides the stock owner with *protection,* eliminating the possibility of any devastating loss on the stock holding during the life of the put. In all the put buying strategies discussed in this chapter and Chapter 18, the put must be paid for in full. That is the only increase in investment.

Although any common stockholder may use this strategy, two general classes of stock owners find it particularly attractive: First, the long-term holder of the stock who is not considering selling the stock may utilize the put protection to limit losses over a short-term horizon. Second, the buyer of common stock who wants some "insurance" in case he is wrong may also find the put protection attractive.

The long-term holder who strongly feels that his stock will drop should probably sell that stock. However, his cost basis may make the capital gains tax on the sale prohibitive. He also may not be entirely sure that the stock will decline – and may want to continue to hold the stock in case it *does* go up. In either case, the purchase of a put will limit the stockholder's downside risk while still allowing room for upside appreciation. A large number of individual and institutional investors have holdings that they might find difficult to sell for one reason or another. The purchase of a low-cost put can often reduce the negative effects of a bear market on their holdings.

The second general class of put buyers for protection includes the investor who is *establishing* a position in the stock. He might want to buy a put at the same time that he buys the stock, thereby creating a position with profitability as depicted in the previous profit graph. He immediately starts out with a position that has limited downside risk with large potential profits if the stock moves up. In this way, he can feel free to hold the stock during the life of the put without worrying about when to sell it if it should experience a temporary setback. Some fairly aggressive stock traders use this technique because it eliminates the necessity of having to place a stop loss order on the stock. It is often frustrating to see a stock fall and touch off one's stop loss limit order, only to subsequently rise in price. The stock owner who has a put for protection need not overreact to a downward move. He can afford to sit back and wait during the life of the put, since he has built-in protection.

WHICH PUT TO BUY

The selection of which put the stock owner purchases will determine how much of his profit potential he is giving up and how much risk he is limiting. An out-of-the-money put will cost very little. Therefore, it will be less of a hindrance on profit potential if the underlying stock rises in price. Unfortunately, the put's protective feature is small until the stock falls to the striking price of the put. Therefore, *the purchase of the out-of-the-money put will not provide as much downside protection as an at- or in-the-money put would.* The purchase of a deeply out-of-the-money put as protection is more like "disaster insurance": It will prevent a stock owner from experiencing a disaster in terms of a downside loss during the life of the put, but will not provide much protection in the case of a limited stock decline.

Example: XYZ is at 40 and the October 35 put is selling for ½. The purchase of this put as protection for the common stock would not reduce upside potential much at all, only by ½ point. However, the stock owner could lose 5½ points if XYZ fell to 35 or below. That is his maximum possible loss, for if XYZ were below 35 at October expiration, he could exercise his put to sell the stock at 35, losing 5 points on the stock, and he would have paid ½ point for the put, bringing his total loss to 5½ points.

At the opposite end of the spectrum, the stock owner might buy an in-the-money put as protection. This would quite severely limit his profit potential, since the underlying stock would have to rise above the strike and more for him to make a profit. However, the in-the-money put provides vast quantities of downside protection, limiting his loss to a very small amount.

Example: XYZ is again at 40 and there is an October 45 put selling for 5½. The stock owner who purchases the October 45 put would have a maximum risk of ½ point, for he could always exercise the put to sell stock at 45, giving him a 5-point *gain* on the stock, but he paid 5½ points for the put, thereby giving him an overall maximum loss of ½ point. He would have difficulty making any profit during the life of the put, however. XYZ would have to rise by more than 5½ points (the cost of the put) for him to make any total profit on the position by October expiration.

The deep in-the-money put purchase is overly conservative and is usually not a good strategy. On the other hand, it is not wise to purchase a put that is too deeply out-of-the-money as protection. *Generally, one should purchase a slightly out-of-the-money put as protection.* This helps to achieve a balance between the positive feature of protection for the common stock and the negative feature of limiting profits.

The reader may find it interesting to know that he has actually gone through this analysis, back in Chapter 3. Glance again at the profit graph for this strategy of using the put purchase to protect a common stock holding (Figure 17-1). It has exactly the same shape as the profit graph of a simple call purchase. *Therefore, the call purchase and the long put/long stock strategies are equivalent.* Again, by equivalent it is meant that they have similar profit potentials. Obviously, the ownership of a call differs substantially from the ownership of common stock and a put. The stock owner continues to maintain his position for an indefinite period of time, while the call holder does not. Also, the stockholder is forced to pay substantially more for his position than is the call holder, and he also receives dividends whereas the call holder does not. Therefore, "equivalent" does not mean *exactly* the same when comparing call-oriented and put-oriented strategies, but rather denotes that they have similar profit potentials.

In Chapter 3, it was determined that the slightly in-the-money call often offers the best ratio between risk and reward. When the call is slightly in-the-money, the stock is above the striking price. Similarly, the slightly out-of-the-money put often offers the best ratio between risk and reward for the common stockholder who is buying the put for protection. Again, the stock is slightly above the striking price. Actually, since the two positions are equivalent, the same conclusions should be arrived at; that is why it was stated that the reader has been through this analysis previously.

TAX CONSIDERATIONS

Although tax considerations are covered in detail in a later chapter, an important tax law concerning the purchase of puts against a common stock holding should be mentioned at this time. If the stock owner is already a long-term holder of the stock at the time that he buys the put, the put purchase has no effect on his tax status. Similarly, if the stock buyer buys the stock at the time that he buys the put and identifies the position as a hedge, there is no effect on the tax status of his stock. However, *if one is currently a short-term holder of the common stock at the time that he buys a put, he eliminates any accrued holding period on his common stock. Moreover, the holding period for that stock does not begin again until the put is sold.*

Example: Assume the long-term holding period is 6 months. That is, a stock owner must own the stock for 6 months before it can be considered a long-term capital gain. An investor who bought the stock and held it for 5 months and then purchased a put would wipe out his entire holding period of 5 months. Suppose he then held the put and the stock simultaneously for 6 months, liquidating the put at the end of 6 months. His holding period would start all over again for that common stock. Even though he has owned the stock for 11 months – 5 months prior to the put purchase and 6 months more while he simultaneously owned the put – his holding period for tax purposes is considered to be zero!

This law could have important tax ramifications, and one should consult a tax advisor if he is in doubt as to the effect that a put purchase might have on the taxability of his common stock holdings.

PUT BUYING AS PROTECTION FOR THE COVERED CALL WRITER

Since put purchases afford protection to the owner of common stock, some investors naturally feel that the same protective feature could be used to limit their downside risk in the covered call writing strategy. Recall that the covered call writing strategy involves the purchase of stock and the sale of a call option against that stock. The covered write has limited upside profit potential and offers protection to the downside in the amount of the call premium. The covered writer will make money if the stock falls a little, remains unchanged, or rises by expiration. The covered writer can actually lose money only if the stock falls by more than the call premium received. He has potentially large downside losses. This strategy is known as a *protective collar* or, more simply, a "collar." (It is also called a "hedge wrapper," although that is an outdated term.)

At the opposite end of the spectrum, the stock owner might buy an in-the-money put as protection. This would quite severely limit his profit potential, since the underlying stock would have to rise above the strike and more for him to make a profit. However, the in-the-money put provides vast quantities of downside protection, limiting his loss to a very small amount.

Example: XYZ is again at 40 and there is an October 45 put selling for $5\frac{1}{2}$. The stock owner who purchases the October 45 put would have a maximum risk of $\frac{1}{2}$ point, for he could always exercise the put to sell stock at 45, giving him a 5-point *gain* on the stock, but he paid $5\frac{1}{2}$ points for the put, thereby giving him an overall maximum loss of $\frac{1}{2}$ point. He would have difficulty making any profit during the life of the put, however. XYZ would have to rise by more than $5\frac{1}{2}$ points (the cost of the put) for him to make any total profit on the position by October expiration.

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The purchase of an out-of-the-money put option can eliminate the risk of large potential losses for the covered write, although the money spent for the put purchase will reduce the overall return from the covered write. One must therefore include the put cost in his initial calculations to determine if it is worthwhile to buy the put.

Example: XYZ is at 39 and there is an XYZ October 40 call selling for 3 points and an XYZ October 35 put selling for ½ point. A covered write could be established by buying the common at 39 and selling the October 40 call for 3. This covered write would have a maximum profit potential of 4 points if XYZ were anywhere above 40 at expiration. The write would lose money if XYZ were anywhere below 36, the break-even point, at October expiration. By also purchasing the October 35 put at the time the covered write is initiated, the covered writer will limit his profit potential slightly, but will also greatly reduce his risk potential. If the put purchase is added to the covered write, the maximum profit potential is reduced to 3½ points at October expiration. The break-even point moves up to 36½, and the writer will experience some loss if XYZ is below 36½ at expiration. However, the most that the writer could lose would be 1½ points if XYZ were below 35 at expiration. The purchase of the put option produces this loss-limiting effect. Table 17-2 and Figure 17-2 depict the profitability of both the regular covered write and the covered write that is protected by the put purchase.

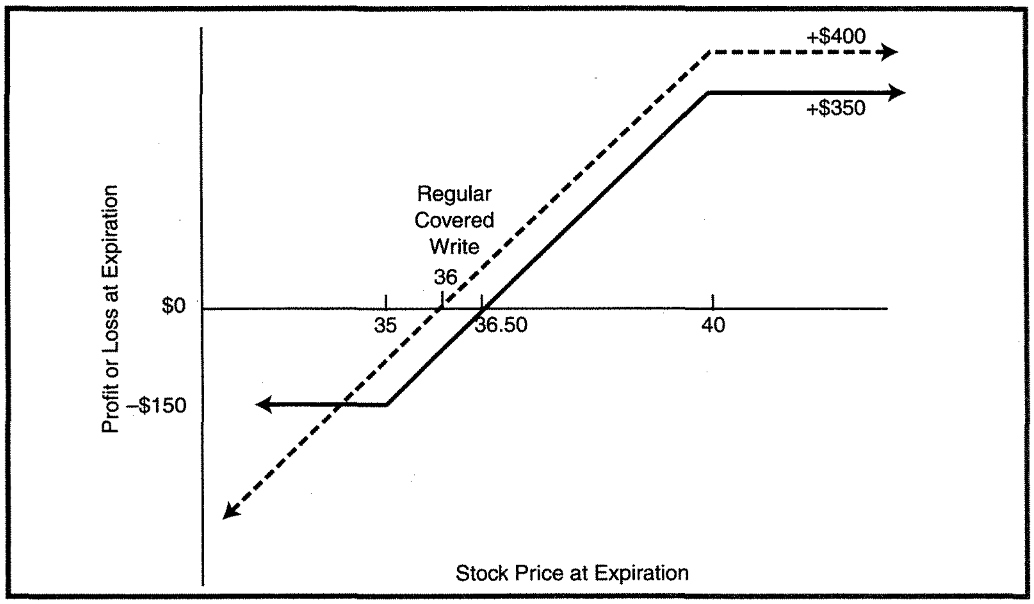
Commissions should be carefully included in the covered writer's return calculations, as well as the cost of the put. It was demonstrated in Chapter 2 that the covered writer must include all commissions and margin interest expenses as well as all dividends received in order to produce an accurate "total return" picture of the covered write. Figure 17-2 shows that the break-even point is raised slightly and the overall profit potential is reduced by the purchase of the put. However, *the maximum risk is quite small and the writer need never be forced to roll down in a disadvantageous situation.*

Recall that the covered writer who does not have the protective put in place is forced to roll down in order to gain increased downside protection. Rolling down merely means that he buys back the call that is currently written and writes another call, with a lower striking price, in its place. This rolling-down action can be helpful if the stock stabilizes after falling; but if the stock reverses and climbs upward in price again, the covered writer who rolled down would have limited his gains. In fact, he may even have "locked in" a loss. The writer who has the protective put need not be bothered with such things. He never has to roll down, for he has a limited maximum loss. Therefore, he should never get into a "locked-in" loss situation. This can be a great advantage, especially from an emotional viewpoint, because the writer is never forced to make a decision as to the future price of the stock in the middle of the stock's decline. With the put in place, he can feel free to take no action at all, since his overall loss is limited. If the stock should rally upward later, he will still be in a position to make his maximum profit.

TABLE 17-2.
Comparison of regular and protected covered writes.

XYZ Price at Expiration	Stock Profit	October 40 Call Profit	October 35 Put Profit	Total Profit
25	-$1,400	+$300	+$950	-$150
30	- 900	+ 300	+ 450	- 150
35	- 400	+ 300	- 50	- 150
36.50	- 250	+ 300	- 50	0
38	- 100	+ 300	- 50	+ 150
40	+ 100	+ 300	- 50	+ 350
45	+ 600	- 200	- 50	+ 350
50	+ 1,100	- 700	- 50	+ 350

FIGURE 17-2.
Covered call write protected by a put purchase.



The longer-term effects of buying puts in combination with covered writes are not easily definable, but it would appear that the writer reduces his overall rate of return slightly by buying the puts. This is because he gives something away if the stock falls slightly, remains unchanged, or rises in price. He only "gains" something if the stock falls heavily. Since the odds of a stock falling heavily are small in comparison to the other events (falling slightly, remaining unchanged, or rising), the writer will be gaining something in only a small percentage of cases. However, the put buying strategy may still prove useful in that it removes the emotional uncertainty of

large losses. The covered writer who buys puts may often find it easier to operate in a more rational manner when he has the protective put in place.

This strategy is equivalent to one that has been described before, the bull spread. Notice that the profit graph in Figure 17-2 has the same shape as the bull spread profit graph (Figure 7-1). This means that the two strategies are equivalent. In fact, in Chapter 7 it was pointed out that the bull spread could sometimes be considered a "substitute" for covered writing. Actually, the bull spread is more akin to this strategy – the covered write protected by a put purchase. There are, of course, differences between the strategies. They are equivalent in profit and loss potential, but the covered writer could never lose all his investment in a short period of time, although the spreader could. In order to actually use bull spreads as substitutes for covered writes, one would invest only a small portion of his available funds in the spread and would place the remainder of his funds in fixed-income securities. That strategy was discussed in more depth in Chapter 7.

NO-COST COLLARS

The "collar" strategy is often arrived at in another manner: a stockholder begins to worry about the downside potential of the stock market and decides to buy puts on his stock as protection. However, he is dismayed by the cost of the puts and so he *also* considers the sale of calls. If he buys an out-of-the-money put, it is quite possible that he might be able to sell an out-of-the-money call whose proceeds completely cover the cost of the put. Thus, he has established a protective *collar* at no cost – at least no debit. His "cost" is the fact that he has forsaken the upside profit potential on his stock, above the striking price of the written call.

In fact, certain large institutional traders are able to transact collars through large over-the-counter option brokers, such as Goldman Sachs or Morgan Stanley. They might even give the broker instructions such as this: "I own XYZ and I want to buy a put 10 percent out of the money that expires in a year. What would the striking price of a one-year call have to be in order to create a no-cost collar?" The broker might then tell him that such a call would have to be struck 30 percent out of the money. The actual strike price of the call would depend on the volatility estimate for the underlying stock, as well as interest rates and dividends. These types of transactions occur with a fair amount of frequency.

Some very interesting situations can be created with long-term options. One of the most interesting occurred in 1999, when a company that owned 5 million shares of Cisco (CSCO) decided it would like to hedge them by creating a no-cost collar over the next three years. At the time, CSCO was trading at about 130, and its volatility was about 50%. It turns out that a three-year put struck at 130 sells for about the

large losses. The covered writer who buys puts may often find it easier to operate in a more rational manner when he has the protective put in place.

This strategy is equivalent to one that has been described before, the bull spread. Notice that the profit graph in Figure 17-2 has the same shape as the bull spread profit graph (Figure 7-1). This means that the two strategies are equivalent. In fact, in Chapter 7 it was pointed out that the bull spread could sometimes be considered a "substitute" for covered writing. Actually, the bull spread is more akin to this strategy – the covered write protected by a put purchase. There are, of course, differences between the strategies. They are equivalent in profit and loss potential, but the covered writer could never lose all his investment in a short period of time, although the spreader could. In order to actually use bull spreads as substitutes for covered writes, one would invest only a small portion of his available funds in the spread and would place the remainder of his funds in fixed-income securities. That strategy was discussed in more depth in Chapter 7.

NO-COST COLLARS

The "collar" strategy is often arrived at in another manner: a stockholder begins to worry about the downside potential of the stock market and decides to buy puts on his stock as protection. However, he is dismayed by the cost of the puts and so he *also* considers the sale of calls. If he buys an out-of-the-money put, it is quite possible that he might be able to sell an out-of-the-money call whose proceeds completely cover the cost of the put. Thus, he has established a protective *collar* at no cost – at least no debit. His "cost" is the fact that he has forsaken the upside profit potential on his stock, above the striking price of the written call.

In fact, certain large institutional traders are able to transact collars through large over-the-counter option brokers, such as Goldman Sachs or Morgan Stanley. They might even give the broker instructions such as this: "I own XYZ and I want to buy a put 10 percent out of the money that expires in a year. What would the striking price of a one-year call have to be in order to create a no-cost collar?" The broker might then tell him that such a call would have to be struck 30 percent out of the money. The actual strike price of the call would depend on the volatility estimate for the underlying stock, as well as interest rates and dividends. These types of transactions occur with a fair amount of frequency.

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TABLE 17-3.
Highest Call Strike That Pays for an At-the-Money Put (Assuming 2.5 years to expiration)

Volatility	Call Strike of Underlying
30%	30% out of money
40%	35% out of money
50%	40% out of money
70%	50% out of money
100%	70% out of money

same price as a three-year call struck at 200! That may seem illogical, but the figures can be checked out with the aid of an option-pricing model. Thus, this company was able to hedge all of its CSCO stock, with no downside risk (the striking price of the puts was the same as the current stock price) and still had profit potential of over 50% to the upside over the next three years.

Thus, one should consider using LEAPS options when he establishes a collar – even if he is not an institutional trader – because the striking price of the calls can be quite high in comparison to that of the put's strike or in comparison to the price of the underlying stock. Table 17-3 shows how far out-of-the-money a written call could be that still covers the cost of buying an at-the-money put. The time to expiration in this table is 2.5 years – the longest term listed option that currently exists as a LEAPS option.

USING LOWER STRIKES AS A PARTIAL COVERED WRITE

It should also be pointed out that one does not necessarily have to forsake all of the profit potential from his stock. He might buy the puts, as usual, and then sell calls with a somewhat lower strike than needed for a low-cost collar, but the quantity of calls sold would be less than that of stock owned. In that way, there would be unlimited profit potential on *some* of the shares of the underlying stock.

Example: Suppose that the following prices exist:

XYZ: 61

Apr 55 put: 1

Apr 65 call: 2

Furthermore, suppose that one owns 1000 shares of XYZ. Thus, the purchase of 10 Apr 55 puts at 1 point apiece would protect the downside. In order to cover the cost of those puts ($1000), one need only sell *five* of the Apr 65 calls at 2 points

apiece. Thus, the protection would have cost nothing and there would still be unlimited profit potential on 500 of the shares of XYZ, since only five calls were sold against the 1000 shares that are owned.

In this manner, one could get quite creative in constructing collars – deciding what call strike to use in order to strike a balance between paying for the puts and allowing upside profit potential. The lower the strike he uses for the written calls, the fewer calls he will have to write; the higher the strike of the written calls, the more calls will be necessary to cover the cost of the purchased puts. The tradeoff is that a lower call strike allows for more eventual upside profit potential, but it limits what has been written against to a lower price.

Using the above example once again, these facts can be demonstrated:

Example (continued): As before, the same prices exist, but now one more call will be brought into the picture:

XYZ: 61

Apr 55 put: 1

Apr 65 call: 2

Apr 70 call: 1

As before one could sell *five* of the Apr 65 calls to cover the cost of ten puts, or as an alternative he could sell *ten* of the Apr 70 calls. If he sells the five, he has unlimited profit potential on 500 shares, but the other 500 shares will be called away at 65. In the alternative strategy, he has limited upside profit potential, but nothing will be called away until the stock reaches 70. Which is "better?" It's not easy to say. In the former strategy, if the stock climbs all the way to 75, it results in the same profit as if the stock is called away at 70 in the latter strategy. This is true because 500 shares would be worth 75, but the other 500 would have been called away at 65 – making for an average of 70. Hence, the former strategy only outperforms the latter if the stock actually climbs *above* 75 – a rather unlikely event, one would have to surmise. Still, many investors prefer the former strategy because it gives them protection without asking them to surrender all of their upside profit potential.

In summary, one can often be quite creative with the "collar" strategy. One thing to keep in mind: if one sells options against stock that he has no intention of selling, he is actually writing *naked* calls in his own mind. That is, if one owns stock that "can't" be sold – perhaps the capital gains would be devastating or the stock has been "in the family" for a long time – then he should not sell covered calls against it, because he will be forced into treating the calls as naked (if he refuses to sell the stock). This can cause quite a bit of consternation if the underlying stock rises significantly in price, that could have easily been avoided by not writing calls against the stock in the first place.

CHAPTER 18

Buying Puts in Conjunction with Call Purchases

There are several ways in which the purchases of both puts and calls can be used to the speculator's advantage. One simple method is actually a follow-up strategy for the call buyer. If the stock has advanced and the call buyer has a profit, he might consider *buying a put as a means of locking in his call profits while still allowing for more potential upside appreciation.* In Chapter 3, four basic alternatives were listed for the call buyer who had a profit: He could liquidate the call and take his profit; he could do nothing; he could "roll up" by selling the call for a profit and using part of the proceeds to purchase more out-of-the-money calls; or he could create a bull spread by selling the out-of-the-money call against the profitable call that he holds. If the underlying stock has listed puts, he has another alternative: He could buy a put. This put purchase would serve to lock in some of the profits on the call and would still allow room for further appreciation if the stock should continue to rise in price.

Example: An investor initially purchased an XYZ October 50 call for 3 points when the stock was at 48. Sometime later, after the stock had risen to 58, the call would be worth about 9 points. If there was an October 60 put, it might be selling for 4 points, and the call holder could buy this put to lock in some of his profits. His position, after purchasing the put, would be:

Long 1 October 50 call at 3 points
Long 1 October 60 put at 4 points – Net cost: 7 points

He would own a "strangle" – any position consisting of both a put and a call with differing terms – that is always worth at least 10 points. The combination will be worth exactly 10 points at expiration if XYZ is anywhere between 50 and 60. For example,

if XYZ is at 52 at expiration, the call will be worth 2 points and the put will be worth 8 points. Alternatively, if the stock is at 58 at expiration, the put will be worth 2 points and the call worth 8 points. Should XYZ be above 60 at expiration, the combination's value will be equal to the call's value, since the put will expire worthless with XYZ above 60. The call would have to be worth more than 10 points in that case, since it has a striking price of 50. Similarly, if XYZ were *below* 50 at expiration, the combination would be worth more than 10 points, since the put would be more than 10 points in-the-money and the call would be worthless.

The speculator has thus created a position in which he cannot lose money, because he paid only 7 points for the combination (3 points for the call and 4 points for the put). No matter what happens, the combination will be worth at least 10 points at expiration, and a 3-point profit is thus locked in. If XYZ should continue to climb in price, the speculator could make more than 3 points of profit whenever XYZ is above 60 at expiration. Moreover, if XYZ should suddenly collapse in price, the speculator could make more than 3 points of profit if the stock was below 50 by expiration. The reader must realize that such a position can never be created as an initial position. This desirable situation arose only because the call had built up a substantial profit before the put was purchased. The similar strategy for the put buyer who might buy a call to protect his unrealized put profits was described in Chapter 16.

STRADDLE BUYING

A straddle purchase consists of buying both a put and a call with the same terms – same underlying stock, striking price, and expiration date. The straddle purchase allows the buyer to make large potential profits if the stock moves far enough in either direction. The buyer has a predetermined maximum loss, equal to the amount of his initial investment.

Example: The following prices exist:

XYZ common, 50;

XYZ July 50 call, 3; and

XYZ July 50 put, 2.

If one purchased both the July 50 call and the July 50 put, he would be buying a straddle. This would cost 5 points plus commissions. The investment required to purchase a straddle is the net debit. If the underlying stock is exactly at 50 at expiration, the buyer would lose all his investment, since both the put and the call would expire worthless. If the stock were above 55 at expiration, the call portion of the

straddle would be worth more than 5 points and the straddle buyer would make money, even though his put expired worthless. To the downside, a similar situation exists. If XYZ were below 45 at expiration, the put would be worth more than 5 points and he would have a profit despite the fact that the call expired worthless. Table 18-1 and Figure 18-1 depict the results of this example straddle purchase at expiration. The straddle buyer can immediately determine his break-even points at expiration – 45 and 55 in this example. He will lose money if the underlying stock is between those break-even points at expiration. He has *potentially large profits* if XYZ should move a great distance away from 50 by expiration.

One would normally purchase a straddle on a relatively volatile stock that has the potential to move far enough to make the straddle profitable in the allotted time. This strategy is particularly attractive when option premiums are low, since low premiums will mean a cheaper straddle cost. Although *losses may occur in a relatively large percentage of cases that are held all the way until their expiration date,* there is actually only a minute probability of losing one's entire investment. Even if XYZ should be at 50 at expiration, there would still be the opportunity to sell the straddle for a small amount on the final day of trading.

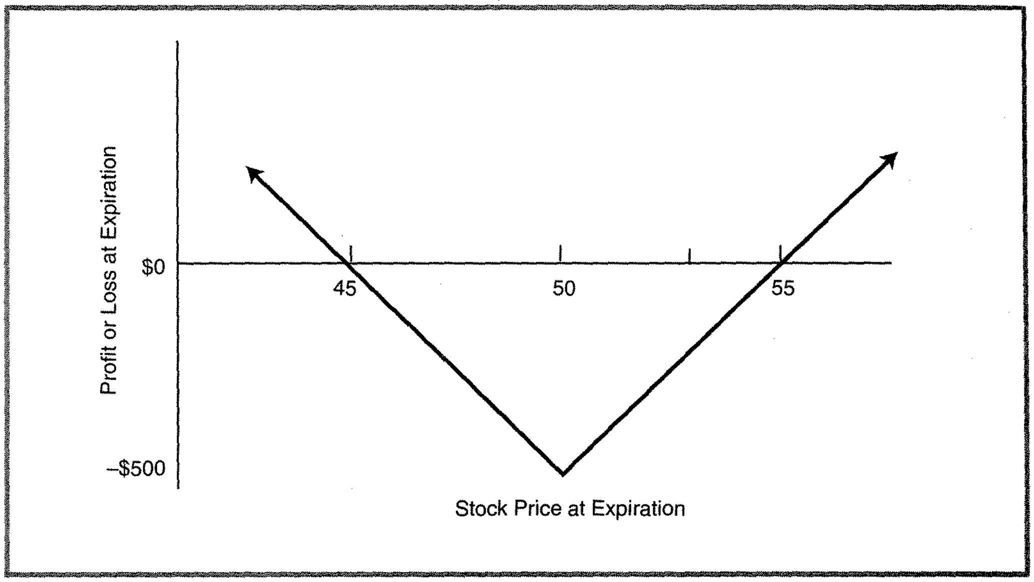
TABLE 18-1.
Results of straddle purchase at expiration.

XYZ Price at Expiration	Call Profit	Put Profit	Total Straddle Profit
30	–$ 300	+$1,800	+$1,500
40	– 300	+ 800	+ 500
45	– 300	+ 300	0
50	– 300	– 200	– 500
55	+ 200	– 200	0
60	+ 700	– 200	+ 500
70	+ 1,700	– 200	+ 1,500

EQUIVALENCES

Straddle buying is equivalent to the reverse hedge, a strategy described in Chapter 4 in which one sells the underlying stock short and purchases two calls on the underlying stock. Both strategies have similar profit characteristics: a limited loss that would occur at the striking price of the options involved, and potentially large profits if the underlying stock should rise or fall far enough in price. *The straddle pur-*

FIGURE 18-1.
Straddle purchase.



chase is superior to the reverse hedge, however, and where listed puts exist on a stock, the reverse hedge strategy becomes obsolete. The reasons that the straddle purchase is superior are that dividends are not paid by the holder and that commission costs are much smaller in the straddle situation.

REVERSE HEDGE WITH PUTS

A third strategy is equivalent to both the straddle purchase and the reverse hedge. It consists of buying the underlying stock and buying two put options. If the stock rises substantially in price, large profits will accrue, for the stock profit will more than offset the fixed loss on the purchase of two put options. If the stock declines in price by a large amount, profits will also be generated. In a decline, the profits generated by 2 long puts will more than offset the loss on 100 shares of long stock. This form of the straddle purchase has limited risk as well. The worst case would occur if the stock were exactly at the striking price of the puts at their expiration date – the puts would both expire worthless. The risk is limited, percentagewise and dollarwise, since the cost of two put options would normally be a relatively small percentage of the total cost of buying the stock. Furthermore, the investor may receive some dividends if the underlying stock is a dividend-paying stock. Buying stock and buying two puts is superior to the reverse hedge strategy, but is still inferior to the straddle purchase.

SELECTING A STRADDLE BUY

In theory, one could find the best straddle purchases by applying the analyses for best call purchases and best put purchases simultaneously. Then, if both the puts and calls on a particular stock showed attractive opportunity, the straddle could be bought. The straddle should be viewed as an entire position. A similar sort of analysis to that proposed for either put or call purchases could be used for straddles as well. First, one would assume the stock would move up or down in accordance with its volatility within a fixed time period, such as 60 or 90 days. Then, the prices of both the put and the call could be predicted for this stock movement. The straddles that offer the best reward opportunity under this analysis would be the most attractive ones to buy.

To demonstrate this sort of analysis, the previous example can be utilized again.

Example: XYZ is at 50 and the July 50 call is selling for 3 while the July 50 put is selling for 2 points. If the strategist is able to determine that XYZ has a 25% chance of being above 54 in 90 days and also has a 25% chance of being below 46 in 90 days, he can then predict the option prices. A rigorous method for determining what percentage chance a stock has of making a predetermined price movement is presented in Chapter 28 on mathematical applications. For now, a general procedure of analysis is more important than its actual implementation. If XYZ were at 54 in 90 days, it might be reasonable to assume that the call would be worth 5½ and the put would be worth 1 point. The straddle would therefore be worth 6½ points. Similarly, if the stock were at 46 in 90 days, the put might be worth 4½ points, and the call worth 1 point, making the entire straddle worth 5½ points. It is fairly common for the straddle to be higher-priced when it is a fixed distance in-the-money on the call side (such as 4 points) than when it is in-the-money on the put side by that same distance. In this example, the strategist has now determined that there is a 25% chance that the straddle will be worth 6½ points in 90 days on an upside movement, and there is a 25% chance that the straddle will be worth 5½ points on a downside movement. The average price of these two expectations is 6 points. Since the straddle is currently selling for 5 points, this would represent a 20% profit. If all potential straddles are ranked in the same manner – allowing for a 25% chance of upside and downside movement by each underlying stock – the straddle buyer will have a common basis for comparing various straddle opportunities.

FOLLOW-UP ACTION

It has been mentioned frequently that there is a good chance that a stock will remain relatively unchanged over a short time period. This does not mean that the stock will

never move much one way or the other, but that its *net* movement over the time period will generally be small.

Example: If XYZ is currently at 50, one might say that its chances of being over 55 at the end of 90 days are fairly small, perhaps 30%. This may even be supported by mathematical analysis based on the volatility of the underlying stock. This does not imply, however, that the stock has only a 30% chance of ever reaching 55 during the 90-day period. Rather, it implies that it has only a 30% chance of being over 55 at the *end* of the 90-day period. These are two distinctly different events, with different probabilities of occurrence. Even though the probability of being over 55 at the end of 90 days might be only 30%, the probability of ever being over 55 during the 90-day period could be amazingly high, perhaps as high as 80%. It is important for the straddle buyer to understand the differences between these events occurring, for he might often be able to take *follow-up action* to improve his position.

Many times, after a straddle is bought, the underlying stock will begin to move strongly, making it appear that the straddle is immediately going to become profitable. However, just as things are going well, the stock reverses and begins to change direction, perhaps so quickly that it would now appear that the straddle will become profitable on the other side. These volatile stock movements often result in little net change, however, and at expiration the straddle buyer may have a loss. One might think that he would take profits on the call side when they became available in a quick upward movement, and then hope for a downward reversal so that he could take profits on the put side as well. *Taking small profits, however, is a poor strategy.* Straddle buying has limited losses and potentially unlimited profits. One might have to suffer through a substantial number of small losses before hitting a big winner, but the magnitude of the gain on that one large stock movement can offset many small losses. By taking small profits, the straddle buyer is immediately cutting off his chances for a substantial gain; that is why it is a poor strategy to limit the profits.

This is one of those statements that sounds easier in theory than it is in practice. It is emotionally distressing to watch the straddle gain 2 or 3 points in a short time period, only to lose that and more when the stock fails to follow through. By using a different example, it is possible to demonstrate the types of follow-up action that the straddle buyer might take.

Example: One had initially bought an XYZ January 40 straddle for 6 points when the stock was 40. After a fairly short time, the stock jumps up to 45 and the following prices exist:

XYZ common, 45:
XYZ January 40 call, 7;
XYZ January 40 put, 1; and
XYZ January 45 put, 3.

The straddle itself is now worth 8 points. The January 45 put price is included because it will be part of one of the follow-up strategies. What could the straddle buyer do at this time? First, he might do nothing, preferring to let the straddle run its course, at least for three months or so. Assuming that he is not content to sit tight, however, he might sell the call, taking his profit, and hope for the stock to then drop in price. This is an inferior course of action, since he would be cutting off potential large profits to the upside.

In the older, over-the-counter option market, one might have tried a technique known as *trading against the straddle.* Since there was no secondary market for over-the-counter options, straddle buyers often traded the stock itself against the straddle that they owned. This type of follow-up action dictated that, if the stock rose enough to make the straddle profitable to the upside, one would sell short the underlying stock. This involved no extra risk, since if the stock continued up, the straddle holder could always exercise his call to cover the short sale for a profit. Conversely, if the underlying stock fell at the outset, making the straddle profitable to the downside, one would *buy* the underlying stock. Again, this involved no extra risk if the stock continued down, since the put could always be exercised to sell the stock at a profit. The idea was to be able to capitalize on large stock price reversals with the addition of the stock position to the straddle. This strategy worked best for the brokers, who made numerous commissions as the trader tried to gauge the whipsaws in the market. In the listed options market, the same strategic effect can be realized (without as large a commission expense) by merely selling out the long call on an upward move, and using part of the proceeds to buy a second put similar to the one already held. On a downside move, one could sell out the long put for a profit and buy a second call similar to the one he already owns. In the example above, the call would be sold for 7 points and a second January 40 put purchased for 1 point. This would allow the straddle buyer to recover his initial 6-point cost and would allow for large downside profit potential. This strategy is not recommended, however, since the straddle buyer is limiting his profit in the direction that the stock is moving. Once the stock has moved from 40 to 45, as in this example, it would be more reasonable to expect that it could continue up rather than experience a drop of more than 5 points.

A more desirable sort of follow-up action would be one whereby the straddle buyer could retain much of the profit already built up without limiting further potential profits if the stock continues to run. In the example above, the straddle buyer could use the January 45 put – the one at the higher price – for this purpose.

Example: Suppose that when the stock got to 45, he sold the put that he owned, the January 40, for 1 point, and simultaneously bought the January 45 put for 3 points. This transaction would cost 2 points, and would leave him in the following position:

Long 1 January 40 call
Long 1 January 45 put – Combined cost: 8 points

He now owns a combination at a cost of 8 points. However, no matter where the underlying stock is at expiration, this combination will be worth at least 5 points, since the put has a striking price 5 points higher than the call's striking price. In fact, if the stock is above 45 at expiration or is below 40 at expiration, the straddle will be worth more than 5 points. This follow-up action has not limited the potential profits. If the stock continues to rise in price, the call will become more and more valuable. On the other hand, if the stock reverses and falls dramatically, the put will become quite valuable. In either case, the opportunity for large potential profits remains. Moreover, the investor has improved his risk exposure. The most that the new position can lose at expiration is 3 points, since the combination cost 8 points originally, and can be sold for 5 points at worst.

To summarize, *if the underlying stock moves up to the next strike, the straddle buyer should consider rolling his put up,* selling the one that he is long and buying the one at the next higher striking price. Conversely, *if the stock starts out with a downward move, he should consider rolling the call down,* selling the one that he is long and buying the one at the next lower strike. In either case, he reduces his risk exposure without limiting his profit potential – exactly the type of follow-up result that the straddle buyer should be aiming for.

BUYING A STRANGLE

A strangle is a position that consists of both a put and a call, which generally have the same expiration date, but different striking prices. The following example depicts a strangle.

Example: One might buy a strangle consisting of an XYZ January 45 put and an XYZ January 50 call. Buying such a strangle is quite similar to buying a straddle, although

there are some differences, as the following discussion will demonstrate. Suppose the following prices exist:

XYZ common, 47;
XYZ January 45 put, 2; and
XYZ January 50 call, 2.

In this example, both options are out-of-the-money when purchased. This, again, is the most normal application of the strangle purchase. If XYZ is still between 45 and 50 at January expiration, both options will expire worthless and the strangle buyer will lose his entire investment. This investment – $400 in the example – is generally smaller than that required to buy a straddle on XYZ. If XYZ moves in either direction, rising above 50 or falling below 45, the strangle will have some value at expiration. In this example, if XYZ is above 54 at expiration, the call will be worth more than 4 points (the put will expire worthless) and the buyer will make a profit. In a similar manner, if XYZ is below 41 at expiration, the put will have a value greater than 4 points and the buyer would make a profit in that case as well. *The potential profits are quite large if the underlying stock should move a great deal before the options expire.* Table 18-2 and Figure 18-2 depict the potential profits or losses from this position at January expiration. The maximum loss is possible over a much wider range than that of a straddle. The straddle achieves its maximum loss only if the stock is exactly at the striking price of the options at expiration. However, the strangle has its maximum loss anywhere between the two strikes at expiration. The actual amount of the loss is smaller for the strangle, and that is a compensating factor. The potential profits are large for both strategies.

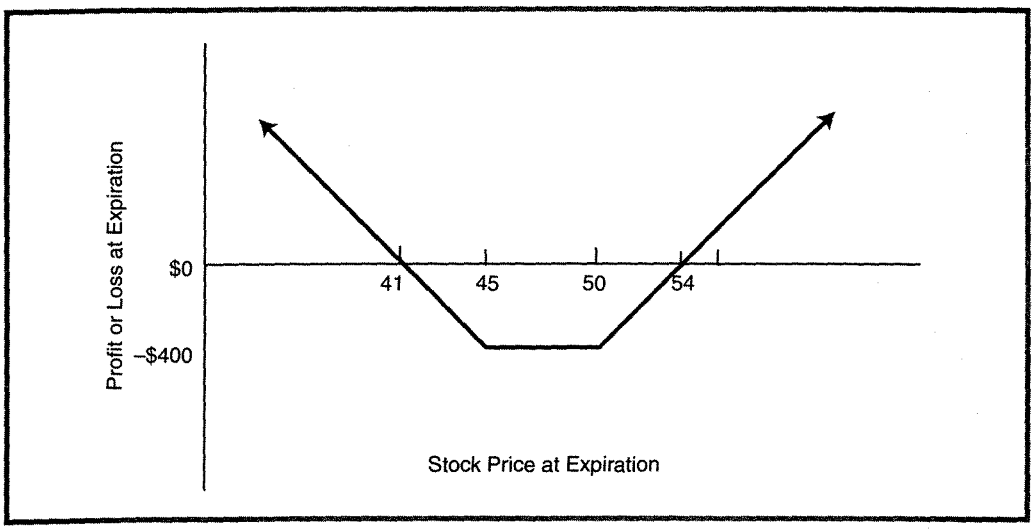
The example above is one in which both options are out-of-the money. It is also possible to construct a very similar position by utilizing in-the-money options.

Example: With XYZ at 47 as before, the in-the-money options might have the following prices: XYZ January 45 call, 4; and XYZ January 50 put, 4. If one purchased this *in-the-money strangle,* he would pay a total cost of 8 points. However, the value of this strangle will always be at least 5 points, since the striking price of the put is 5 points higher than that of the call. The reader has seen this sort of position before, when protective follow-up strategies for straddle buying and for call or put buying were described. Because the strangle will always be worth at least 5 points, the most that the in-the-money strangle buyer can lose is 3 points in this example. His potential profits are still unlimited should the underlying stock move a large distance. Thus, even though it requires a larger initial investment, *the in-the-money strangle may often be a superior strategy to the out-of-the-money strangle, from a buyer's*

TABLE 18-2.
Results at expiration of a strangle purchase.

XYZ Price at Expiration	Put Profit	Call Profit	Total Profit
25	+$1,800	-$ 200	+$1,600
35	+ 800	- 200	+ 600
41	+ 200	- 200	0
43	0	- 200	- 200
45	- 200	- 200	- 400
47	- 200	- 200	- 400
50	- 200	- 200	- 400
54	- 200	+ 200	0
60	- 200	+ 800	+ 600
70	- 200	+ 1,800	+ 1,600

FIGURE 18-2.
Strangle purchase.



viewpoint. The in-the-money strangle purchase certainly involves less percentage risk: The buyer can never lose all his investment, since he can always get back 5 points, even in the worst case (when XYZ is between 45 and 50 at expiration). His percentage profits are lower with the in-the-money strangle purchase, since he paid more for the strangle to begin with. These observations should come as no surprise,

since when the outright purchase of a call was discussed, it was shown that the purchase of an in-the-money call was more conservative than the purchase of an out-of-the-money call, in general. The same was true for the outright purchase of puts, perhaps even more so, because of the smaller time value of an in-the-money put. Therefore, the strangle created by the two – an in-the-money call and an in-the-money put – should be more conservative than the out-of-the-money strangle.

If the underlying stock moves quickly in either direction, the strangle buyer may sometimes be able to take action to protect some of his profits. He would do so in a manner similar to that described for the straddle buyer. For example, if the stock moved up quickly, he could sell the put that he originally bought and buy the put at the next higher striking price in its place. If he had started from an out-of-the-money strangle position, this would then place him in a straddle. The strategist should not blindly take this sort of follow-up action, however. It may be overly expensive to "roll up" the put in such a manner, depending on the amount of time that has passed and the actual option prices involved. Therefore, it is best to analyze each situation on a case-by-case basis to see whether it is logical to take any follow-up action at all.

As a final point, the out-of-the-money strangles may appear deceptively cheap, both options selling for fractions of a point as expiration nears. However, the probability of realizing the maximum loss equal to one's initial investment is fairly large with strangles. This is distinctly different from straddle purchases, whereby the probability of losing the entire investment is small. The aggressive speculator should not place a large portion of his funds in out-of-the-money strangle purchases. The percentage risk is smaller with the in-the-money strangle, being equal to the amount of time value premium paid for the options initially, but commission costs will be somewhat larger. In either case, the underlying stock still needs to move by a relatively large amount in order for the buyer to profit.

CHAPTER 19

The Sale of a Put

The buyer of a put stands to profit if the underlying stock drops in price. As might then be expected, the seller of a put will make money if the underlying stock increases in price. The uncovered sale of a put is a more common strategy than the covered sale of a put, and is therefore described first. It is a bullishly-oriented strategy.

THE UNCOVERED PUT SALE

Since the buyer of a put has a right to sell stock at the striking price, the writer of a put is obligating himself to buy that stock at the striking price. For assuming this obligation, he receives the put option premium. If the underlying stock advances and the put expires worthless, the put writer will not be assigned and *he could make a maximum profit equal to the premium received.* He has large downside risk, since the stock could fall substantially, thereby increasing the value of the written put and causing large losses to occur. An example will aid in explaining these general statements about risk and reward.

Example: XYZ is at 50 and a 6-month put is selling for 4 points. The naked put writer has a fixed potential profit to the upside – $400 in this example – and a large potential loss to the downside (Table 19-1 and Figure 19-1). This downside loss is limited only by the fact that a stock cannot go below zero.

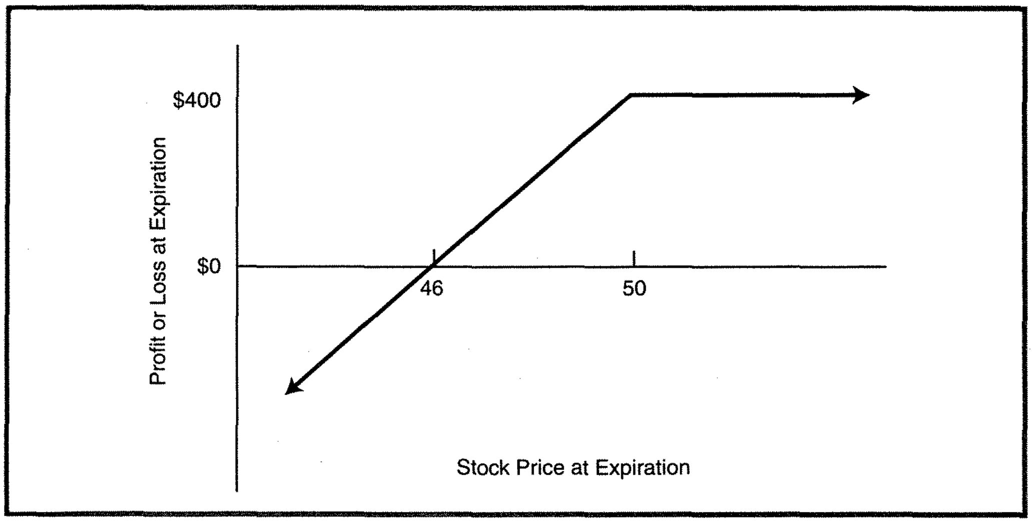
The collateral requirement for writing naked puts is the same as that for writing naked calls. The requirement is equal to 20% of the current stock price plus the put premium minus any out-of-the-money amount.

Example: If XYZ is at 50, the collateral requirement for writing a 4-point put with a striking price of 50 would be $1,000 (20% of 5,000) plus $400 for the put premium

TABLE 19-1.
Results from the sale of an uncovered put.

XYZ Price at Expiration	Put Price at Expiration (Parity)	Put Sale Profit
30	20	-$1,600
40	10	- 600
46	4	0
50	0	+ 400
60	0	+ 400
70	0	+ 400

FIGURE 19-1.
Uncovered sale of a put.



for a total of $1,400. If the stock were above the striking price, the striking price differential would be subtracted from the requirement. The minimum requirement is 10% of the put's *striking price,* plus the put premium, even if the computation above yields a smaller result.

The uncovered put writing strategy is similar in many ways to the covered call writing strategy. Note that the profit graphs have the same shape; this means that the two strategies are equivalent. It may be helpful to the reader to describe the aspects of naked put writing by comparing them to similar aspects of covered call writing.

In either strategy, one needs to be somewhat bullish, or at least neutral, on the underlying stock. If the underlying stock moves upward, the uncovered put writer will make a profit, possibly the entire amount of the premium received. If the underlying stock should be unchanged at expiration – a neutral situation – the put writer will profit by the amount of the time value premium received when he initially wrote the put. This could represent the maximum profit if the put was out-of-the-money initially, since that would mean that the entire put premium was composed of time value premium. For an in-the-money put, however, the time value premium would represent something less than the entire value of the option. These are similar qualities to those inherent in covered call writing. If the stock moves up, the covered call writer can make his maximum profit. However, if the stock is unchanged at expiration, he will make his maximum profit only if the stock is above the call's striking price. So, *in either strategy, if the position is established with the stock above the striking price, there is a greater probability of achieving the maximum profit.* This represents the less aggressive application: writing an out-of-the-money put initially, which is equivalent to the covered write of an in-the-money call.

The more aggressive application of naked put writing is to write an in-the-money put initially. The writer will receive a larger amount of premium dollars for the in-the-money put and, if the underlying stock advances far enough, he will thus make a large profit. By increasing his profit potential in this manner, he assumes more risk. If the underlying stock should fall, the in-the-money put writer will lose money more quickly than one who initially wrote an out-of-the-money put. Again, these facts were demonstrated much earlier with covered call writing. An in-the-money covered call write affords more downside protection but less profit potential than does an out-of-the-money covered call write.

It is fairly easy to summarize all of this by noting that in either the naked put writing strategy or the covered call writing strategy, *a less aggressive position is established when the stock is higher than the striking price of the written option. If the stock is below the striking price initially, a more aggressive position is created.*

There are, of course, some basic differences between covered call writing and naked put writing. First, the naked put write will generally require a smaller investment, since one is only collateralizing 20% of the stock price plus the put premium, as opposed to 50% for the covered call write on margin. Also, the naked put writer is not actually investing cash; collateral is used, so he may finance his naked put writing through the value of his present portfolio, whether it be stocks, bonds, or government securities. However, any losses would create a debit and might therefore cause him to disturb a portion of this portfolio. It should be pointed out that one *can,* if he wishes, write naked puts in a cash account by depositing cash or cash equivalents equal to the striking price of the put. This is called "cash-based put writing." The covered call

writer receives the dividends on the underlying stock, but the naked put writer does not. In certain cases, this may be a substantial amount, but it should also be pointed out that the puts on a high-yielding stock will have more value and the naked put writer will thus be taking in a higher premium initially. From strictly a rate of return viewpoint, naked put writing is superior to covered call writing. Basically, there is a different psychology involved in writing naked puts than that required for covered call writing. The covered call write is a comfortable strategy for most investors, since it involves common stock ownership. Writing naked options, however, is a more foreign concept to the average investor, even if the strategies are equivalent. Therefore, it is relatively unlikely that the same investor would be a participant in both strategies.

FOLLOW-UP ACTION

The naked put writer would take protective follow-up action if the underlying stock drops in price. His simplest form of follow-up action is to close the position at a small loss if the stock drops. Since in-the-money puts tend to lose time value premium rapidly, he may find that his loss is often quite small if the stock goes against him. In the example above, XYZ was at 50 with the put at 4. If the stock falls to 45, the writer may be able to quite easily repurchase the put for 5½ or 6 points, thereby incurring a fairly small loss.

In the covered call writing strategy, it was recommended that the strategist roll down wherever possible. One reason for doing so, rather than closing the covered call position, is that stock commissions are quite large and one cannot generally afford to be moving in and out of stocks all the time. It is more advantageous to try to preserve the stock position and roll the calls down. This commission disadvantage does not exist with naked put writing. When one closes the naked put position, he merely buys in the put. Therefore, *rolling down is not as advantageous for the naked put writer.* For example, in the paragraph above, the put writer buys in the put for 5½ or 6 points. He could roll down by selling a put with striking price 45 at that time. However, there may be better put writing situations in other stocks, and there should be no reason for him to continue to preserve a position in XYZ stock.

In fact, this same reasoning can be applied to any sort of rolling action for the naked put writer. It is extremely advantageous for the covered call writer to roll forward; that is, to buy back the call when it has little or no time value premium remaining in it and sell a longer-term call at the same striking price. By doing so, he takes in additional premium without having to disturb his stock position at all. However, the naked put writer has little advantage in rolling forward. He can also take in additional premium, but when he closes the initial uncovered put, he should then evaluate

other available put writing positions before deciding to write another put on the same underlying stock. His commission costs are the same if he remains in XYZ stock or if he goes on to a put writing position in a different stock.

EVALUATING A NAKED PUT WRITE

The computation of potential returns from a naked put write is not as straightforward as were the computations for covered call writing. The reason for this is that the collateral requirement changes as the stock moves up or down, since any naked option position is marked to the market. *The most conservative approach is to allow enough collateral in the position in case the underlying stock should fall,* thus increasing the requirement. In this way, the naked put writer would not be forced to prematurely close a position because he cannot maintain the margin required.

Example: XYZ is at 50 and the October 50 put is selling for 4 points. The initial collateral requirement is 20% of 50 plus $400, or $1,400. There is no additional requirement, since the stock is exactly at the striking price of the put. Furthermore, let us assume that the writer is going to close the position should the underlying stock fall to 43. To maintain his put write, he should therefore allow enough margin to collateralize the position if the stock were at 43. The requirement at that stock price would be $1,560 (20% of 43 plus at least 7 points for the in-the-money amount). Thus, the put writer who is establishing this position should allow $1,560 of collateral value for each put written. Of course, this collateral requirement can be reduced by the amount of the proceeds received from the put sale, $400 per put less commissions in this example. If we assume that the writer sells 5 puts, his gross premium inflow would be $2,000 and his commission expense would be about $75, for a net premium of $1,925.

Once this information has been determined, it is a simple matter to determine the maximum potential return and also the downside break-even point. To achieve the maximum potential return, the put would expire worthless with the underlying stock above the striking price. Therefore, the maximum potential profit is equal to the net premium received. The return is merely that profit divided by the collateral used. In the example above, the maximum potential profit is $1,925. The collateral required is $1,560 per put (allowing for the stock to drop to 43) or $7,800 for 5 puts, reduced by the $1,925 premium received, for a total requirement of $5,875. The potential return is then $1,925 divided by $5,875, or 32.8%. Table 19-2 summarizes these calculations.

TABLE 19-2.
Calculation of the potential return of uncovered put writing.

XYZ: 50	
XYZ January 50 put: 4	
Potential profit:	
Sell 5 puts	$2,000
Less commissions	– 75
Potential maximum profit (premium received)	$1,925
Break-even point:	
Striking price	$50.00
Less premium per put ($1,925/5)	– 3.85
Break-even stock price	46.15
Collateral required (allowing for stock to drop to 43):	
20% of 43	$ 860
Plus put premium	+ 700
	$1,560
	× 5
Requirement for 5 puts	$7,800
Less premium received	– 1,925
Net collateral	$5,875
Potential return:	
Premium divided by net collateral	$1,925/$5,875 = 32.8%

There are differences of opinion on how to compute the potential returns from naked put writing. The method presented above is a more conservative one in that it takes into consideration a larger collateral requirement than the initial requirement. Of course, since one is not really investing cash, but is merely using the collateral value of his present portfolio, it may even be correct to claim that one has no investment at all in such a position. This may be true, but it would be impossible to compare various put writing opportunities without having a return computation available.

One other important feature of return computations is the return if unchanged. If the put is initially out-of-the-money, the return if unchanged is the same as the maximum potential return. However, if the put is initially in-the-money, the computation must take into consideration what the writer would have to pay to buy back the put when it expires.

Example: XYZ is 48 and the XYZ January 50 put is selling for 5 points. The profit that could be made if the stock were unchanged at expiration would be only 3 points, less commissions, since the put would have to be repurchased for 2 points with XYZ at 48 at expiration. Commissions for the buy-back should be included as well, to make the computation as accurate as possible.

As was the case with covered call writing, one can create several rankings of naked put writes. One list might be the *highest potential returns.* Another list could be the put writes that provide the *most downside protection;* that is, the ones that have the least chance of losing money. Both lists need some screening applied to them, however. When considering the maximum potential returns, one should take care to ensure at least some room for downside movement.

Example: If XYZ were at 50, the XYZ January 100 put would be selling at 50 also and would most assuredly have a tremendously large maximum potential return. However, there is no room for downside movement at all, and one would surely not write such a put. One simple way of allowing for such cases would be to reject any put that did not offer at least 5% downside protection. Alternatively, *one could also reject situations in which the return if unchanged is below 5%.*

The other list, involving maximum downside protection, also must have some screens applied to it.

Example: With XYZ at 70, the XYZ January 50 put would be selling for ½ at most. Thus, it is extremely unlikely that one would lose money in this situation; the stock would have to fall 20 points for a loss to occur. However, there is practically nothing to be made from this position, and one would most likely not ever write such a deeply out-of-the-money put.

A minimum acceptable level of return must accompany the items on this list of put writes. For example, one might decide that the return would have to be at least 12% on an annualized basis in order for the put write to be on the list of positions offering the most downside protection. Such a requirement would preclude an extreme situation like that shown above. Once these screens have been applied, the lists can then be ranked in a normal manner. The put writes offering the highest returns would be at the top of the more aggressive list, and those offering the highest percentage of downside protection would be at the top of the more conservative list. In the strictest sense, a more advanced technique to incorporate the volatility of the underlying stock should rightfully be employed. As mentioned previously, that technique is presented in Chapter 28 on mathematical applications.

BUYING STOCK BELOW ITS MARKET PRICE

In addition to viewing naked put writing as a strategy unto itself, as was the case in the previous discussion, *some investors who actually want to acquire stock will often write naked puts as well.*

Example: XYZ is a $60 stock and an investor feels it would be a good buy at 55. He places an open buy order with a limit of 55. Three months later, XYZ has drifted down to 57 but no lower. It then turns and rises heavily, but the buy limit was never reached, and the investor misses out on the advance.

This hypothetical investor could have used a naked put to his advantage. Suppose that when XYZ was originally at 60, this investor wrote a naked three-month put for 5 points instead of placing an open buy limit order. Then, if XYZ is anywhere below 60 at expiration, he will have stock put to him at 60. That is, he will have to buy stock at 60. However, since he received 5 points for the put sale, his net cost for the stock is 55. Thus, even if XYZ is at 57 at expiration and has never been any lower, the investor can still buy XYZ for a net cost of 55.

Of course, if XYZ rose right away and was above 60 at expiration, the put would not be assigned and the investor would not own XYZ. However, he would still have made $500 from selling the put, which is now worthless. The put writer thus assumes a more active role in his investments by acting rather than waiting. He receives at least some compensation for his efforts, even though he did not get to buy the stock.

If, instead of rising, XYZ fell considerably, say to 40 by expiration, the investor would be forced to purchase stock at a net cost of 55, thereby giving himself an immediate paper loss. He was, however, going to buy stock at 55 in any case, so the put writer and the investor using a buy limit have the same result in this case. Critics may point out that any buy order for common stock may be canceled if one's opinion changes about purchasing the stock. The put writer, of course, may do the same thing by closing out his obligation through a closing purchase of the put.

This technique is useful to many types of investors who are oriented toward eventually owning the stock. Large portfolio managers as well as individual investors may find the sale of puts useful for this purpose. *It is a method of attempting to accumulate a stock position at prices lower than today's market price.* If the stock rises and the stock is not bought, the investor will at least have received the put premium as compensation for his efforts.

SOME CAUTION IS REQUIRED

Despite the seemingly benign nature of naked put writing, it can be a highly dangerous strategy for two reasons: (1) Large losses are possible if the underlying stock

takes a nasty fall, and (2) collateral requirements are small, so it is possible to utilize a great deal of leverage. It may seem like a good idea to write out-of-the-money puts on "quality" stocks that you "wouldn't mind owning." However, any stock is subject to a crushing decline. In almost any year there are serious declines in one or more of the largest stocks in America (IBM in 1991, Procter and Gamble in 1999, and Xerox in 1999, just to name a few). If one happens to be short puts on such stocks – and worse yet, if he happens to have overextended himself because he had the initial margin required to sell a great deal of puts – then he could actually be wiped out on such a decline. Therefore, do not leverage your account heavily in the naked put strategy, regardless of the "quality" of the underlying stock.

THE COVERED PUT SALE

By definition, a put sale is covered only if the investor also owns a corresponding put with striking price equal to or greater than the strike of the written put. This is a spread. However, *for margin purposes, one is covered if he sells a put and is also short the underlying stock.* The margin required is strictly that for the short sale of the stock; there is none required for the short put. This creates a position with limited profit potential that is obtained if the underlying stock is anywhere below the striking price of the put at expiration. There is unlimited upside risk, since if the underlying stock rises, the short sale of stock will accrue losses, while the profit from the put sale is limited. This is really a position equivalent to a naked call write, except that the covered put writer must pay out the dividend on the underlying stock, if one exists. The naked sale of a call also has an advantage over this strategy in that commission costs are considerably smaller. In addition, the time value premium of a call is generally higher than that of a put, so that the naked call writer is taking in more time premium. The covered put sale is a little-used strategy that appears to be inferior to naked call writing. As a result, the strategy is not described more fully.

RATIO PUT WRITING

A ratio put write involves the short sale of the underlying stock plus the sale of 2 puts for each 100 shares sold short. This strategy has a profit graph exactly like that of a ratio call write, achieving its maximum profit at the striking price of the written options, and having large potential losses if the underlying stock should move too far in either direction. The ratio call write is a highly superior strategy, however, for the reasons just outlined. The ratio call writer receives dividends while the ratio put

writer would have to pay them out. In addition, the ratio call writer will generally be taking in larger amounts of time value premium, because calls have more time premium than puts do. Therefore, the ratio put writing strategy is not a viable one.

CHAPTER 20

The Sale of a Straddle

Selling a straddle involves selling both a put and a call with the same terms. As with any type of option sale, the straddle sale may be either covered or uncovered. Both uses are fairly common. The covered sale of a straddle is very similar to the covered call writing strategy and would generally appeal to the same type of investor. The uncovered straddle write is more similar to ratio call writing, and is attractive to the more aggressive strategist who is interested in selling large amounts of time premium in hopes of collecting larger profits if the underlying stock remains fairly stable.

THE COVERED STRADDLE WRITE

In this strategy, *one owns the underlying stock and simultaneously writes a straddle on that stock.* This may be particularly appealing to investors who are already involved in covered call writing. In reality, this position is not totally covered – only the sale of the call is covered by the ownership of the stock. The sale of the put is uncovered. However, the name "covered straddle" is generally used for this type of position in order to distinguish it from the uncovered straddle write.

Example: XYZ is at 51 and an XYZ January 50 call is selling for 5 points while an XYZ January 50 put is selling for 4 points. A covered straddle write would be established by buying 100 shares of the underlying stock and simultaneously selling one put and one call. The similarity between this position and a covered call writer's position should be obvious. The covered straddle write is actually a covered write – long 100 shares of XYZ plus short one call – coupled with a naked put write. Since the naked put write has already been shown to be equivalent to a covered call write, *this position is quite similar to a 200-share covered call write.* In fact, all the profit and loss

characteristics of a covered call write are the same for the covered straddle write. There is limited upside profit potential and potentially large downside risk.

Readers will remember that the sale of a naked put is *equivalent* to a covered call write. Hence, a covered straddle write can be thought of either as the equivalent of a 200-share covered call write, *or as the sale of two uncovered puts.* In fact, there is some merit to the strategy of selling two puts instead of establishing a covered straddle write. Commission costs would be smaller in that case, and so would the initial investment required (although the introduction of leverage is not always a good thing).

The maximum profit is attained if XYZ is anywhere above the striking price of 50 at expiration. The amount of maximum profit in this example is $800: the premium received from selling the straddle, less the 1-point loss on the stock if it is called away at 50. In fact, the maximum profit potential of a covered straddle write is quickly computed using the following formula:

Maximum profit = Straddle premium + Striking price – Initial stock price

The break-even point in this example is 46. Note that the covered writing portion of this example – buying stock at 51 and selling a call for 5 points – has a break-even point of 46. The naked put portion of the position has a break-even point of 46 as well, since the January 50 put was sold for 4 points. Therefore, the combined position – the covered straddle write – must have a break-even point of 46. Again, this observation is easily defined by an equation:

$$\text{Break-even price} = \frac{\text{Stock price} + \text{Strike price} - \text{Straddle premium}}{2}$$

Table 20-1 and Figure 20-1 compare the covered straddle write to a 100-share covered call write of the XYZ January 50 at expiration.

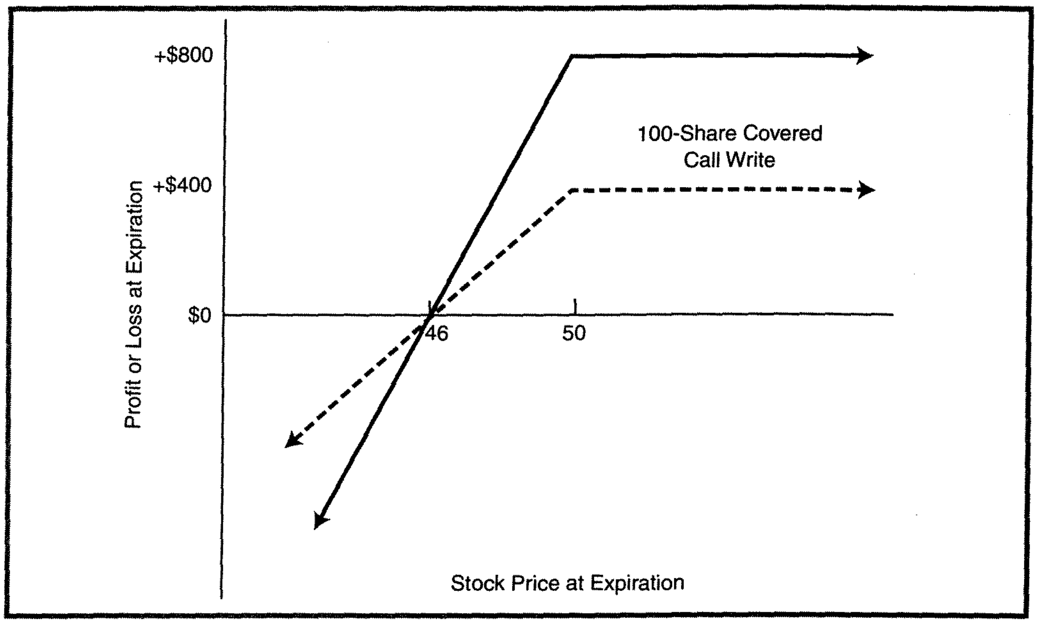
The attraction for the covered call writer to become a covered straddle writer is that he may be able to increase his return without substantially altering the parameters of his covered call writing position. Using the prices in Table 20-1, if one had decided to establish a covered write by buying XYZ at 51 and selling the January 50 call at 5 points, he would have a position with its maximum potential return anywhere above 50 and with a break-even point of 46. By adding the naked put to his covered call position, he does not change the price parameters of his position; he still makes his maximum profit anywhere above 50 and he still has a break-even point of 46. Therefore, he does not have to change his outlook on the underlying stock in order to become a covered straddle writer.

The investment is increased by the addition of the naked put, as are the potential dollars of profit if the stock is above 50 and the potential dollars of loss if the stock

TABLE 20-1.
Results at expiration of covered straddle write.

Stock Price	(A) 100-Share Covered Write	(B) Put Write	Covered Straddle Write (A + B)
35	-$1,100	-$1,100	-$2,200
40	- 600	- 600	- 1,200
46	0	0	0
50	+ 400	+ 400	+ 800
60	+ 400	+ 400	+ 800

FIGURE 20-1.
Covered straddle write.



is below 46 at expiration. The covered straddle writer loses money twice as fast on the downside, since his position is similar to a 200-share covered write. Because the commissions are smaller for the naked put write than for the covered call write, the covered call writer who adds a naked put to his position will generally increase his return somewhat.

Follow-up action can be implemented in much the same way it would be for a covered call write. Whenever one would normally roll his call in a covered situation,

he now rolls the entire straddle – rolling down for protection, rolling up for an increase in profit potential, and rolling forward when the time value premium of the straddle dissipates. Rolling up or down would probably involve debits, unless one rolled to a longer maturity.

Some writers might prefer to make a slight adjustment to the covered straddle writing strategy. Instead of selling the put and call at the same price, they prefer to sell an out-of-the-money put against the covered call write. That is, if one is buying XYZ at 50 and selling the call, he might then also sell a put at 45. This would increase his upside profit potential and would allow for the possibility of both options expiring worthless if XYZ were anywhere between 45 and 50 at expiration. Such action would, of course, increase the potential dollars of risk if XYZ fell below 45 by expiration, but the writer could always roll the call down to obtain additional downside protection.

One final point should be made with regard to this strategy. The covered call writer who is writing on margin and is fully utilizing his borrowing power for call writing will have to add additional collateral in order to write covered straddles. This is because the put write is uncovered. However, the covered call writer who is operating on a cash basis can switch to the covered straddle writing strategy without putting up additional funds. He merely needs to move his stock to a margin account and use the collateral value of the stock he already owns in order to sell the puts necessary to implement the covered straddle writes.

THE UNCOVERED STRADDLE WRITE

In an uncovered straddle write, *one sells the straddle without owning the underlying stock.* In broad terms, this is a neutral strategy with limited profit potential and large risk potential. However, the probability of making a profit is generally quite large, and methods can be implemented to reduce the risks of the strategy.

Since one is selling both a put and a call in this strategy, he is initially taking in large amounts of time value premium. If the underlying stock is relatively unchanged at expiration, the straddle writer will be able to buy the straddle back for its intrinsic value, which would normally leave him with a profit.

Example: The following prices exist:

XYZ common, 45;
XYZ January 45 call, 4; and
XYZ January 45 put, 3.

A straddle could be sold for 7 points. If the stock were above 38 and below 52 at expiration, the straddle writer would profit, since the in-the-money option could be bought back for less than 7 points in that case, while the out-of-the-money option expires worthless (Table 20-2).

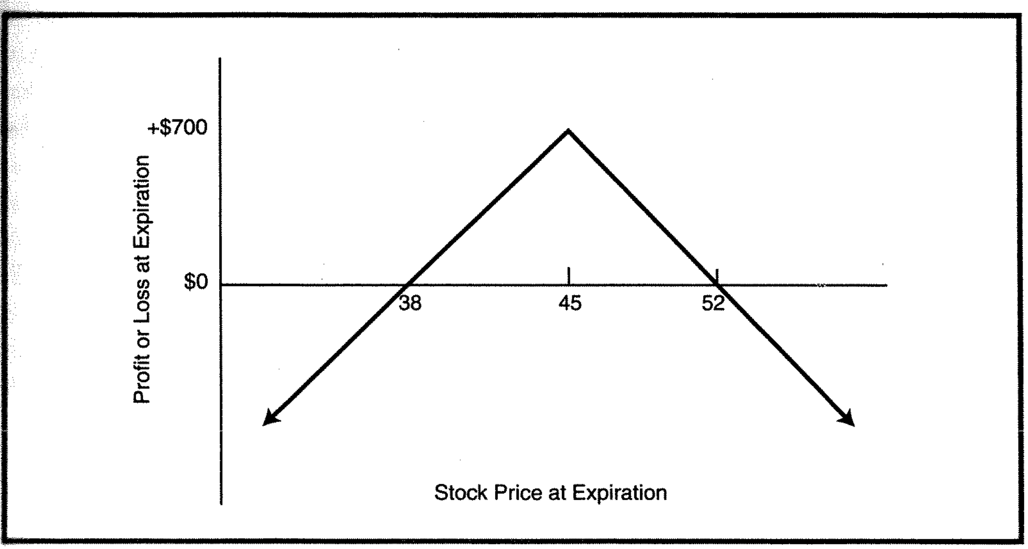
TABLE 20-2.
The naked straddle write.

XYZ Price at Expiration	Call Profit	Put Profit	Total Profit
30	+$ 400	−$1,200	−$800
35	+ 400	− 700	− 300
38	+ 400	− 400	0
40	+ 400	− 200	+ 200
45	+ 400	+ 300	+ 700
50	− 100	+ 300	+ 200
52	− 300	+ 300	0
55	− 600	+ 300	− 300
60	− 1,100	+ 300	− 800

Notice that Figure 20-2 has a shape like a roof. *The maximum potential profit point is at the striking price at expiration, and large potential losses exist in either direction if the underlying stock should move too far.* The reader may recall that the ratio call writing strategy – buying 100 shares of the underlying stock and selling two calls – has the same profit graph. These two strategies, the naked straddle write and the ratio call write, are equivalent. The two strategies do have some differences, of course, as do all equivalent strategies; but they are similar in that both are highly probabilistic strategies that can be somewhat complex. In addition, both have large potential risks under adverse market conditions or if follow-up strategies are not applied.

The investment required for a naked straddle is the greater of the requirement on the call or the put. In general, this means that the margin requirement is equal to the requirement for the in-the-money option in a simple naked write. This requirement is 20% of the stock price plus the in-the-money option premium. *The straddle writer should allow enough collateral so that he can take whatever follow-up actions he deems necessary without having to incur a margin call.* If he is intending to close out the straddle if the stock should reach the upside break-even point – 52 in the example above – then he should allow enough collateral to finance the position with

FIGURE 20-2.
Naked straddle sale.



the stock at 52. If, however, he is planning to take other action that might involve staying with the position if the stock goes to 55 or 56, he should allow enough collateral to be able to finance that action. If the stock never gets that high, he will have excess collateral while the position is in place.

SELECTING A STRADDLE WRITE

Ideally, one would like to receive a premium for the straddle write that produces a profit range that is wide in relation to the volatility of the underlying stock. In the example above, the profit range is 38 to 52. This may or may not be extraordinarily wide, depending on the volatility of XYZ. This is a somewhat subjective measurement, although one could construct a simple straddle writer's index that ranked straddles based on the following simple formula:

$$\text{Index} = \frac{\text{Straddle time value premium}}{\text{Stock price} \times \text{Volatility}}$$

Refinements would have to be made to such a ranking, such as eliminating cases in which either the put or the call sells for less than ½ point (or even 1 point, if a more restrictive requirement is desired) or cases in which the in-the-money time premium is small. Furthermore, the index would have to be annualized to be able to compare straddles for different expiration months. More advanced selection criteria, in the

form of an expected return analysis, will be presented in Chapter 28 on mathematical applications.

More screens can be added to produce a more conservative list of straddle writes. For example, one might want to ignore any straddles that are not worth at least a fixed percentage, say 10%, of the underlying stock price. Also, straddles that are too short-term, such as ones with less than 30 days of life remaining, might be thrown out as well. The remaining list of straddle writing candidates should be ones that will provide reasonable returns under favorable conditions, and also should be readily adaptable to some of the follow-up strategies discussed later. Finally, one would generally like to have some amount of technical support at or above the lower break-even price and some technical resistance at or below the upper break-even point. Thus, once the computer has generated a list of straddles ranked by an index such as the one listed above, the straddle writer can further pare down the list by looking at the technical pictures of the underlying stocks.

FOLLOW-UP ACTION

The risks involved in straddle writing can be quite large. When market conditions are favorable, one can make considerable profits, even with restrictive selection requirements, and even by allowing considerable extra collateral for adverse stock movements. However, in an extremely volatile market, especially a bullish one, losses can occur rapidly and follow-up action must be taken. Since the time premium of a put tends to shrink when it goes into-the-money, there is actually slightly less risk to the downside than there is to the upside. In an extremely bullish market, the time value premiums of call options will not shrink much at all and might even expand. This may force the straddle writer to pay excessive amounts of time value premium to buy back the written straddle, especially if the movement occurs well in advance of expiration.

The simplest form of follow-up action is to buy the straddle back when and if the underlying stock reaches a break-even point. The idea behind doing so is to limit the losses to a small amount, because the straddle should be selling for only slightly more than its original value when the stock has reached a break-even point. In practice, there are several flaws in this theory. If the underlying stock arrives at a break-even point well in advance of expiration, the amount of time value premium remaining in the straddle may be extremely large and the writer will be losing a fairly large amount by repurchasing the straddle. Thus, a break-even point at expiration is probably a loss point prior to expiration.

Example: After the straddle is established with the stock at 45, there is a sudden rally in the stock and it climbs quickly to 52. The call might be selling for 9 points, even

though it is 7 points in-the-money. This is not unusual in a bullish situation. Moreover, the put might be worth 1½ points. This is also not unusual, as out-of-the-money puts with a large amount of time remaining tend to hold time value premium very well. Thus, the straddle writer would have to pay 10½ points to buy back this straddle, even though it is at the break-even point, 7 points in-the-money on the call side.

This example is included merely to demonstrate that *it is a misconception to believe that one can always buy the straddle back at the break-even point and hold his losses to mere fractions of a point by doing so.* This type of buy-back strategy works best when there is little time remaining in the straddle. In that case, the options will indeed be close to parity and the straddle will be able to be bought back for close to its initial value when the stock reaches the break-even point.

Another follow-up strategy that can be employed, similar to the previous one but with certain improvements, is to *buy back only the in-the-money option when it reaches a price equal to that of the initial straddle price.*

Example: Again using the same situation, suppose that when XYZ began to climb heavily, the call was worth 7 points when the stock reached 50. The in-the-money option – the call – is now worth an amount equal to the initial straddle value. It could then be bought back, leaving the out-of-the-money put naked. As long as the stock then remained above 45, the put would expire worthless. In practice, the put could be bought back for a small fraction after enough time had passed or if the underlying stock continued to climb in price.

This type of follow-up action does not depend on taking action at a fixed stock price, but rather is triggered by the option price itself. It is therefore a *dynamic* sort of follow-up action, one in which the same action could be applied at various stock prices, depending on the amount of time remaining until expiration. One of the problems with closing the straddle at the break-even points is that the break-even point is only a valid break-even point at expiration. A long time before expiration, this stock price will not represent much of a break-even point, as was pointed out in the last example. Thus, buying back only the in-the-money option at a fixed price may often be a superior strategy. The drawback is that one does not release much collateral by buying back the in-the-money option, and he is therefore stuck in a position with little potential profit for what could amount to a considerable length of time. The collateral released amounts to the in-the-money amount; the writer still needs to collateralize 20% of the stock price.

One could adjust this follow-up method to attempt to retain some profit. For example, he might decide to buy the in-the-money option when it has reached a

value that is 1 point less than the total straddle value initially taken in. This would then allow him the chance to make a 1-point profit overall, if the other option expired worthless. In any case, there is always the risk that the stock would suddenly reverse direction and cause a loss on the remaining option as well. This method of follow-up action is akin to the ratio writing follow-up strategy of using buy and sell stops on the underlying stock.

Before describing other types of follow-up action that are designed to combat the problems described above, it might be worthwhile to address the method used in ratio writing – rolling up or rolling down. *In straddle writing, there is often little to be gained from rolling up or rolling down.* This is a much more viable strategy in ratio writing; one does not want to be constantly moving in and out of stock positions, because of the commissions involved. However, with straddle writing, once one position is closed, there is no need to pursue a similar straddle in that same stock. It may be more desirable to look elsewhere for a new straddle position.

There are two other very simple forms of follow-up action that one might consider using, although neither one is for most strategists. *First, one might consider doing nothing at all,* even if the underlying stock moves by a great deal, figuring that the advantage lies in the probability that the stock will be back near the striking price by the time the options expire. This action should be used only by the most diversified and well-heeled investors, for in extreme market periods, almost all stocks may move in unison, generating tremendous losses for anyone who does not take some sort of action. *A more aggressive type of follow-up action would be to attempt to "leg out" of the straddle,* by buying in the profitable side and then hoping for a stock price reversal in order to buy back the remaining side. In the example above, when XYZ ran up to 52, an aggressive trader would buy in the put at 1½, taking his profit, and then hope for the stock to fall back in order to buy the call in cheaper. This is a very aggressive type of follow-up action, because the stock could easily continue to rise in price, thereby generating larger losses. This is a trader's sort of action, not that of a disciplined strategist, and it should be avoided.

In essence, follow-up action should be designed to do two things: First, to limit the risk in the position, and second, to still allow room for a potential profit to be made. None of the above types of follow-up action accomplish both of these purposes. There is, however, a follow-up strategy that does allow the straddle writer to limit his losses while still allowing for a potential profit.

Example: After the straddle was originally sold for 7 points when the stock was at 45, the stock experiences a rally and the following prices exist:

XYZ common, 50;

XYZ January 45 call, 7;

XYZ January 45 put, 1; and
XYZ January 50 call, 3.

The January 50 call price is included because it will be part of the follow-up strategy. Notice that this straddle has a considerable amount of time value premium remaining in it, and thus would be rather expensive to buy back at the current time. Suppose, however, that the straddle writer does not touch the January 45 straddle that he is short, but instead buys the January 50 call for protection to the upside. Since this call costs 3 points, he will now have a position with a total credit of 4 points. (The straddle was originally sold for 7 points credit and he is now spending 3 points for the call at 50.) This action of buying a call at a higher strike than the striking price of the straddle has limited the potential loss to the upside, no matter how far the stock might run up. If XYZ is anywhere above 50 at expiration, the put will expire worthless and the writer will have to pay 5 points to close the call spread – short January 45, long January 50. This means that his maximum potential loss is 1 point plus commissions if XYZ is anywhere above 50 at expiration.

In addition to being able to limit the upside loss, this type of follow-up action still allows room for potential profits. If XYZ is anywhere between 41 and 49 at expiration – that is, less than 4 points away from the striking price of 45 – the writer will be able to buy the straddle back for less than 4 points, thereby making a profit.

Thus, the straddle writer has both limited his potential losses to the upside and also allowed room for profit potential should the underlying stock fall back in price toward the original striking price of 45. Only severe price reversal, with the stock falling back below 40, would cause a large loss to be taken. In fact, by the time the stock could reverse its current strong upward momentum and fall all the way back to 40, a significant amount of time should have passed, thereby allowing the writer to purchase the straddle back with only a relatively small amount of time premium left in it.

This follow-up strategy has an effect on the margin requirement of the position. When the calls are bought as protection to the upside, the writer has, for margin purposes, a bearish spread in the calls and an uncovered put. The margin for this position would normally be less than that required for the straddle that is 5 points in-the-money.

A secondary move is available in this strategy.

Example: The stock continues to climb over the short term and the out-of-the-money put drops to a price of less than ½ point. The straddle writer might now consider buying back the put, thereby leaving himself with a bear spread in the calls. His net credit left in the position, after buying back the put at ½, would be

$3\frac{1}{2}$ points. Thus, if XYZ should reverse direction and be within $3\frac{1}{2}$ points of the striking price – that is, anywhere below $48\frac{1}{2}$ – at expiration, the position will produce a profit. In fact, if XYZ should be below 45 at expiration, the entire bear spread will expire worthless and the strategist will have made a $3\frac{1}{2}$-point profit. Finally, this repurchase of the put releases the margin requirement for the naked put, and will generally free up excess funds so that a new straddle position can be established in another stock while the low-requirement bear spread remains in place.

In summary, this type of follow-up action is broader in purpose than any of the simpler buy-back strategies described earlier. It will limit the writer's loss, but not prevent him from making a profit. Moreover, he may be able to release enough margin to be able to establish a new position in another stock by buying in the uncovered puts at a fractional price. This would prevent him from tying up his money completely while waiting for the original straddle to reach its expiration date. The same type of strategy also works in a downward market. If the stock falls after the straddle is written, one can buy the put at the next lower strike to limit the downside risk, while still allowing for profit potential if the stock rises back to the striking price.

EQUIVALENT STOCK POSITION FOLLOW-UP

Since there are so many follow-up strategies that can be used with the short straddle, the one method that summarizes the situation best is again the equivalent stock position (ESP). Recall that the ESP of an option position is the multiple of the quantity times the delta times the shares per option. The quantity is a negative number if it is referring to a short position. Using the above scenario, an example of the ESP method follows:

Example: As before, assume that the straddle was originally sold for 7 points, but the stock rallied. The following prices and deltas exist:

XYZ common, 50;

XYZ Jan 45 call, 7; delta, .90;

XYZ Jan 45 put, 1; delta, – .10; and

XYZ Jan 50 call, 3; delta, .60.

Assume that 8 straddles were sold initially and that each option is for 100 shares of XYZ. The ESP of these 8 short straddles can then be computed:

Option	Position	Delta	ESP
Jan 45 call	short 8	0.90	short 720 ($-8 \times .9 \times 100$)
Jan 45 put	short 8	-0.10	long 80 ($-8 \times -.1 \times 100$)
Total ESP			short 640 shares

Obviously, the position is quite short. Unless the trader were extremely bearish on XYZ, he should make an adjustment. The simplest adjustment would be to buy 600 shares of XYZ. Another possibility would be to buy back 7 of the short January 45 calls. Such a purchase would add a delta long of 630 shares to the position ($7 \times .9 \times 100$). This would leave the position essentially neutral. As pointed out in the previous example, however, the strategist may not want to buy that option. If, instead, he decided to try to buy the January 50 call to hedge the short straddle, he would have to buy 10 of those to make the position neutral. He would buy that many because the delta of that January 50 is 0.60; a purchase of 10 would add a delta long of 600 shares to the position.

Even though the purchase of 10 is theoretically correct, since one is only short 8 straddles, he would probably buy only 8 January 50 calls as a practical matter.

STARTING OUT WITH THE PROTECTION IN PLACE

In certain cases, the straddle writer may be able to initially establish a position that has no risk in one direction: He can buy an out-of-the-money put or call at the same time the straddle is written. This accomplishes the same purposes as the follow-up action described in the last few paragraphs, but the protective option will cost less since it is out-of-the-money when it is purchased. There are, of course, both positive and negative aspects involved in adding an out-of-the-money long option to the straddle write at the outset.

Example: Given the following prices:

XYZ, 45;

XYZ January 45 straddle, 7; and

XYZ January 50 call, 1½,

the upside risk will be limited. If one writes the January 45 straddle for 7 points and buys the January 50 call for 1½ points, his overall credit will be 5½ points. He has no upside risk in this position, for if XYZ should rise and be over 50 at expiration, he will be able to close the position by buying back the call spread for 5 points. The put will expire worthless. The out-of-the-money call has eliminated any risk above 50 on the

$3\frac{1}{2}$ points. Thus, if XYZ should reverse direction and be within $3\frac{1}{2}$ points of the striking price – that is, anywhere below $48\frac{1}{2}$ – at expiration, the position will produce a profit. In fact, if XYZ should be below 45 at expiration, the entire bear spread will expire worthless and the strategist will have made a $3\frac{1}{2}$-point profit. Finally, this repurchase of the put releases the margin requirement for the naked put, and will generally free up excess funds so that a new straddle position can be established in another stock while the low-requirement bear spread remains in place.

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position. Another advantage of buying the protection initially is that one is protected if the stock should experience a gap opening or a trading halt. If he already owns the protection, such stock price movement in the direction of the protection is of little consequence. However, if he was planning to buy the protection as a follow-up action, the sudden surge in the stock price may ruin his strategy.

The overall profit potential of this position is smaller than that of the normal straddle write, since the premium paid for the long call will be lost if the stock is below 50 at expiration. However, the automatic risk-limiting feature of the long call may prove to be worth more than the decrease in profit potential. The strategist has peace of mind in a rally and does not have to worry about unlimited losses accruing to the upside.

Downside protection for a straddle writer can be achieved in a similar manner by buying an out-of-the-money put at the outset.

Example: With XYZ at 45, one might write the January 45 straddle for 7 and buy a January 40 put for 1 point if he is concerned about the stock dropping in price.

It should now be fairly easy to see that the straddle writer could limit risk in either direction by initially buying both an out-of-the-money call and an out-of-the-money put at the same time that the straddle is written. The major benefit in doing this is that risk is limited in either direction. Moreover, the margin requirements are significantly reduced, since the whole position consists of a call spread and a put spread. There are no longer any naked options. The detriment of buying protection on both sides initially is that commission costs increase and the overall profit potential of the straddle write is reduced, perhaps significantly, by the cost of two long options. Therefore, one must evaluate whether the cost of the protection is too large in comparison to what is received for the straddle write. This completely protected strategy can be very attractive when available, and it is described again in Chapter 23, Spreads Combining Calls and Puts.

In summary, any strategy in which the straddle writer also decides to buy protection presents both advantages and disadvantages. Obviously, the risk-limiting feature of the purchased options is an advantage. However, the seller of options does not like to purchase pure time value premium as protection at any time. He would generally prefer to buy intrinsic value. The reader will note that, in each of the protective buying strategies discussed above, the purchased option has a large amount of time value premium left in it. Therefore, the writer must often try to strike a delicate balance between trying to limit his risk on one hand and trying to hold down the expenses of buying long options on the other hand. In the final analysis, however, the risk must be limited regardless of the cost.

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STRANGLE (COMBINATION) WRITING

Recall that a strangle is any position involving both puts and calls, when there is some difference in the terms of the options. Commonly, the puts and calls will have the same expiration date but differing striking prices. *A strangle write is usually established by selling both an out-of-the-money put and an out-of-the-money call with the stock approximately centered between the two striking prices.* In this way, the naked option writer can remain neutral on the outlook for the underlying stock, even when the stock is not near a striking price.

This strategy is quite similar to straddle writing, except that *the strangle writer makes his maximum profit over a much wider range than the straddle writer does.* In this or any other naked writing strategy, the most money that the strategist can make is the amount of the premium received. The straddle writer has only a minute chance of making a profit of the entire straddle premium, since the stock would have to be exactly at the striking price at expiration in order for both the written put and call to expire worthless. The strangle writer will make his maximum profit potential if the stock is anywhere between the two strikes at expiration, because both options will expire worthless in that case. This strategy is equivalent to the variable ratio write described previously in Chapter 6 on ratio call writing.

Example: Given the following prices:

XYZ common, 65;

XYZ January 70 call, 4; and

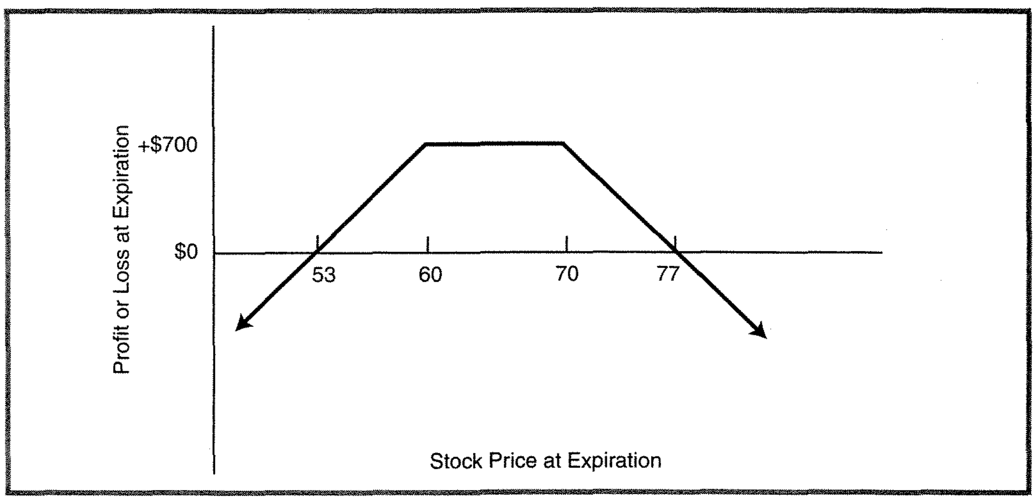
XYZ January 60 put, 3,

a strangle write would be established by selling the January 70 call and the January 60 put. If XYZ is anywhere between 60 and 70 at January expiration, both options will expire worthless and the strangle writer will make a profit of 7 points, the amount of the original credit taken in. If XYZ is above 70 at expiration, the strategist will have to pay something to buy back the call. For example, if XYZ is at 77 at expiration, the January 70 call will have to be bought back for 7 points, thereby creating a break-even situation. To the downside, if XYZ were at 53 at expiration, the January 60 put would have to be bought back for 7 points, thereby defining that as the downside break-even point. Table 20-3 and Figure 20-3 outline the potential results of this strangle write. The profit range in this example is quite wide, extending from 53 on the downside to 77 on the upside. With the stock presently at 65, this is a relatively neutral position.

TABLE 20-3.
Results of a combination write.

Stock Price at Expiration	Call Profit	Put Profit	Total Profit
40	+$ 400	-$1,700	-$1,300
50	+ 400	- 700	- 300
53	+ 400	- 400	0
57	+ 400	0	+ 400
60	+ 400	+ 300	+ 700
65	+ 400	+ 300	+ 700
70	+ 400	+ 300	+ 700
73	+ 100	+ 300	+ 400
77	- 300	+ 300	0
80	- 600	+ 300	- 300
90	- 1,600	+ 300	- 1,300

FIGURE 20-3.
Sale of a combination.



At first glance, this may seem to be a more conservative strategy than straddle writing, because the profit range is wider and the stock needs to move a great deal to reach the break-even points. In the absence of follow-up action, this is a true observation. However, if the stock begins to rise quickly or to drop dramatically, the strangle writer often has little recourse but to buy back the in-the-money option in order

to limit his losses. This can, as has been shown previously, entail a purchase price involving excess amounts of time value premium, thereby generating a significant loss.

The only other alternative that is available to the strangle writer (outside of attempting to trade out of the position) is to convert the position into a straddle if the stock reaches either break-even point.

Example: If XYZ rose to 70 or 71 in the previous example, the January 70 put would be sold. Depending on the amount of collateral available, the January 60 put may or may not be bought back when the January 70 put is sold. This action of converting the strangle write into a straddle write will work out well if the stock stabilizes. It will also lessen the pain if the stock continues to rise. However, if the stock reverses direction, the January 70 put write will prove to be unprofitable. Technical analysis of the underlying stock may prove to be of some help in deciding whether or not to convert the strangle write into a straddle. If there appears to be a relatively large chance that the stock could fall back in price, it is probably not worthwhile to roll the put up.

This example of a strangle write is one in which the writer received a large amount of premium for selling the put and the call. Many times, however, an aggressive strangle writer is tempted to sell two out-of-the-money options that have only a short life remaining. These options would generally be sold at fractional prices. This can be an extremely aggressive strategy at times, for if the underlying stock should move quickly in either direction through a striking price, there is little the strangle writer can do. He must buy in the options to limit his loss. Nevertheless, this type of strangle writing – selling short-term, fractionally priced, out-of-the-money options – appeals to many writers. This is a similar philosophy to that of the naked call writer described in Chapter 5, who writes calls that are nearly restricted, figuring there will be a large probability that the option will expire worthless. It also has the same risk: A large price change or gap opening can cause such devastating losses that many profitable trades are wiped away. Selling fractionally priced combinations is a poor strategy and should be avoided.

Before leaving the topic of strangle writing, it may be useful to determine how the margin requirements apply to a strangle write. Recall that the margin requirement for writing a straddle is 20% of the stock price plus the price of either the put or the call, whichever is in-the-money. In a strangle write, however, both options may be out-of-the-money, as in the example above. When this is the case, the straddle writer is allowed to deduct the smaller out-of-the-money amount from his requirement. Thus, if XYZ were at 68 and the January 60 put and the January 70 call had been written, the collateral requirement would be 20% of the stock price, plus the

call premium, less $200 – the lesser out-of-the-money amount. The call is 2 points out-of-the-money and the put is 8 points out-of-the-money. Actually, the true collateral requirement for any write involving both puts and calls – straddle write or strangle write – is *the greater of the requirement on the put or the call, plus the amount by which the other option is in-the-money.* The last phrase, the amount by which the other option is in-the-money, applies to a situation in which a strangle had been constructed by selling two in-the-money options. This is a less popular strategy, since the writer generally receives less time value premium by writing two in-the-money options. An example of an in-the-money strangle is to sell the January 60 call and the January 70 put with the stock at 65.

FURTHER COMMENTS ON UNCOVERED STRADDLE AND STRANGLE WRITING

When ratio writing was discussed, it was noted that it was a strategy with a high probability of making a limited profit. Since the straddle write is equivalent to the ratio write and the strangle write is equivalent to the variable ratio write, the same statement applies to these strategies. The practitioner of straddle and strangle writing must realize, however, that protective follow-up action is mandatory in limiting losses in a very volatile market. There are other techniques that the straddle writer can sometimes use to help reduce his risk.

It has often been mentioned that puts lose their time value premium more quickly when they become in-the-money options than calls do. *One can often construct a neutral position by writing an extra put or two.* That is, if one sells 5 or 6 puts and 4 calls with the same terms, he may often have created a more neutral position than a straddle write. If the stock moves up and the call picks up time premium in a bullish market, the extra puts will help to offset the negative effect of the calls. On the other hand, if the stock drops, the 5 or 6 puts will not hold as much time premium as the 4 calls are losing – again a neutral, standoff position. If the stock begins to drop too much, the writer can always balance out the position by selling another call or two. The advantage of writing an extra put or two is that it counterbalances the straddle writer's most severe enemy: a quick, extremely bullish rise by the underlying stock.

USING THE DELTAS

This analysis, that adding an extra short put creates a neutral position, can be substantiated more rigorously. Recall that a ratio writer or ratio spreader can use the

deltas of the options involved in his position to determine a neutral ratio. The straddle writer can do the same thing, of course. It was stated that the difference between a call's delta and a put's delta is approximately one. Using the same prices as in the previous straddle writing example, and assuming the call's delta to be .60, a neutral ratio can be determined.

Prices		Deltas
XYZ common:	45	
XYZ January 45 call:	4	.60
XYZ January 45 put:	3	–.40 (.60 – 1)

The put has a negative delta, to indicate that the put and the underlying stock are inversely related. A neutral ratio is determined by dividing the call's delta by the put's delta and ignoring the minus sign. The resultant ratio – 1.5:1 (.60/.40) in this case – is the ratio of puts to sell for each call that is sold. Thus, one should sell 3 puts and sell 2 calls to establish a neutral position. The reader may wonder if the assumption that an at-the-money call has a delta of .60 is a fair one. It generally is, although very long-term calls will have higher at-the-money deltas, and very short-term calls will have deltas near .50. Consequently, a 3:2 ratio is often a neutral one. When neutral ratios were discussed with respect to ratio writing, it was mentioned that selling 5 calls and buying 300 shares of stock often results in neutral ratio. The reader should note that a straddle constructed by selling 3 puts and 2 calls is equivalent to the ratio write in which one sells 5 calls and buys 300 shares of stock.

If a straddle writer is going to use the deltas to determine his neutral ratio, he should compute each one at the time of his initial investment, of course, rather than relying on a generality such as that 3 puts and 2 calls often result in a neutral position. The deltas can be used as a follow-up action, by adjusting the ratio to remain neutral after a move by the underlying stock.

AVOID EXCESS TRADING

In any of the straddle and strangle writing strategies described above, too much follow-up action can be detrimental because of the commission costs involved. Thus, although it is important to take protective action, the straddle writer should plan in advance to make the minimum number of strategic moves to protect himself. That is why buying protection is often useful; not only does it limit the risk in the direction that the stock is moving, but it also involves only one additional option commission. In fact, if it is feasible, buying protection at the outset is often a better strategy than protecting as a secondary action.

An extension of this concept of trying to avoid too much follow-up action is that *the strategist should not attempt to anticipate movement in an underlying stock.* For example, if the straddle writer has planned to take defensive action should the stock reach 50, he should not anticipate by taking action with the stock at 48 or 49. It is possible that the stock could retreat back down; then the writer would have taken a defensive action that not only cost him commissions, but reduced his profit potential. Of course, there is a little trader in everyone, and the temptation to anticipate (or to wait too long) is always there. Unless there are very strong technical reasons for doing so, the strategist should resist the temptation to trade, and should operate his strategy according to his original plan. The ratio writer may actually have an advantage in this respect, because he can use buy and sell stops on the underlying stock to remove the emotion from his follow-up strategy. This technique was described in Chapter 6 on ratio call writing. Unfortunately, no such emotionless technique exists for the straddle or strangle writer.

USING THE CREDITS

In previous chapters, it was mentioned that the sale of uncovered options does not require any cash investment on the part of the strategist. He may use the collateral value of his present portfolio to finance the sale of naked options. Moreover, once he sells the uncovered options, he can take the premium dollars that he has brought in from the sales to buy fixed-income securities, such as Treasury bills. The same statements naturally apply to the straddle writing and strangle writing strategies. However, the strategist should not be overly obsessed with continuing to maintain a credit balance in his positions, nor should he strive to hold onto the Treasury bills at all costs. If one's follow-up actions dictate that he must take a debit to avoid losses or that he should sell out his Treasury bills to keep a credit, he should by all means do so.

CHAPTER 21

Synthetic Stock Positions Created by Puts and Calls

It is possible for a strategist to establish a position that is essentially the same as a stock position, and he can do this using only options. The option position generally requires a smaller margin investment and may have other residual benefits over simply buying stock or selling stock short. In brief, the strategies are summarized by:

1. Buy call and sell put instead of buying stock.
2. Buy put and sell call instead of selling stock short.

SYNTHETIC LONG STOCK

When one buys a call and sells a put at the same strike, he sets up a position that is equivalent to owning the stock. His position is sometimes called "synthetic" long stock.

Example: To verify that this option position acts much like a long stock position would, suppose that the following prices exist:

XYZ common, 50;

XYZ January 50 call, 5; and

XYZ January 50 put, 4.

If one were bullish on XYZ and wanted to buy stock at 50, he might consider the alternative strategy of buying the January 50 call and selling (uncovered) the January

50 put. By using the option strategy, the investor has nearly the same profit and loss potential as the stock buyer, as shown in Table 21-1. The two right-hand columns of the table compare the results of the option strategy with the results that would be obtained by merely owning the stock at 50.

The table shows that the result of the option strategy is exactly $100 less than the stock results for any price at expiration. Thus, the "synthetic" long stock and the actual long stock have nearly the same profit and loss potentials. The reason there is a difference in the results of the two equivalent positions lies in the fact that the option strategist had to pay 1 point of time premium in order to set up his position. This time premium represents the $100 by which the "synthetic" position underperforms the actual stock position at expiration. Note that, with XYZ at 50, both the put and the call are completely composed of time value premium initially. The synthetic position consists of paying out 5 points of time premium for the call and receiving in 4 points of time premium for the put. The net time premium is thus a 1-point payout.

The reason one would consider using the synthetic long stock position rather than the stock position itself is that the synthetic position may require a much smaller investment than buying the stock would require. The purchase of the stock requires $5,000 in a cash account or $2,500 in a margin account (if the margin rate is 50%). However, the synthetic position requires only a $100 debit plus a collateral requirement – 20% of the stock price, plus the put premium, minus the difference between the striking price and the stock price. The balance, invested in short-term funds, would earn enough money, theoretically, to offset the $100 paid for the synthetic position. In this example, the collateral requirement would be 20% of $5,000, or $1,000, plus the $400 put premium, plus the $100 debit incurred by paying 5 for the call and only receiving 4 for the put. This is a total of $1,500 initially. There is no

TABLE 21-1.
Synthetic long stock position.

XYZ Price at Expiration	January 50 Call Result	January 50 Put Result	Total Option Result	Long Stock Result
40	–$500	–$600	–$1,100	–$1,000
45	– 500	– 100	– 600	– 500
50	– 500	+ 400	– 100	0
55	0	+ 400	+ 400	+ 500
60	+ 500	+ 400	+ 900	+ 1,000

initial difference between the stock price and the striking price. Of course, this collateral requirement would increase if the stock fell in price, and would decrease if the stock rose in price, since there is a naked put. Also notice that buying stock creates a $5,000 debit in the account, whereas the option strategy's debit is $100; the rest is a collateral requirement, not a cash requirement.

The effect of this reduction in margin required is that some leverage is obtained in the position. If XYZ rose to 60, the stock position profit would be $1,000 for a return of 40% on margin ($1,000/$2,500). With the option strategy, the percentage return would be higher. The profit would be $900 and the return thus 60% ($900/$1,500). Of course, leverage works to the downside as well, so that the percent risk is also greater in the option strategy.

The synthetic stock strategy is generally not applied merely as an alternative to buying stock. Besides possibly having a smaller profit potential, *the option strategist does not collect dividends, whereas the stock owner does.* However, the strategist is able to earn interest on the funds that he did not spend for stock ownership. It is important for the strategist to understand that a long call plus a short put is equivalent to long stock. It thus may be possible for the strategist to substitute the synthetic option position in certain option strategies that normally call for the purchase of stock.

SYNTHETIC SHORT SALE

A position that is equivalent to the short sale of the underlying stock can be established by selling a call and simultaneously buying a put. This alternative option strategy, in general, offers significant benefits when compared with selling the stock short. Using the prices above – XYZ at 50, January 50 call at 5, and January 50 put at 4 – Table 21-2 depicts the potential profits and losses at January expiration.

Both the option position and the short stock position have similar results: large potential profits if the stock declines and unlimited losses if the underlying stock rises in price. However, the option strategy does better than the stock position, because the option strategist is getting the benefit of the time value premium. Again, this is because the call has more time value premium than the put, which works to the option strategist's advantage in this case, when he is selling the call and buying the put.

Two important factors make the option strategy preferable to the short sale of stock: (1) There is no need to borrow stock, and (2) there is no need for an uptick. When one sells stock short, he must first borrow the stock from someone who owns it. This procedure is handled by one's brokerage firm's stock loan department. If, for

TABLE 21-2.
Synthetic short sale position.

XYZ Price at Expiration	January 50 Call Result	January 50 Put Result	Total Option Result	Short Stock Result
40	+$500	+$600	+$1,100	+$1,000
45	+ 500	+ 100	+ 600	+ 500
50	+ 500	− 400	+ 100	0
55	0	− 400	− 400	− 500
60	− 500	− 400	− 900	− 1,000

some reason, no one who owns the stock wants to loan it out, then a short sale cannot be executed. In addition, both the NYSE and NASDAQ require that a stock being sold short must be sold on an uptick. That is, the price of the short sale must be higher than the previous sale. This rule was introduced (for the NYSE) years ago in order to prevent traders from slamming the market down in a "bear raid."

With the *option* "synthetic short sale" strategy, however, one does not have to worry about either of these factors. First, calls can be sold short at will; there is no need to borrow anything. Also, calls can be sold short (and puts bought) even though the underlying stock might be trading on a minus tick (a downtick). Many professional traders use the "synthetic short sale" strategy because it allows them to get equivalently short the stock in a very timely manner. If one wants to short stock, and if he has not previously arranged to borrow it, then some time is wasted while one's broker checks with the stock loan department in order to make sure that the stock can indeed be borrowed.

There is a caveat, however. If one sells calls on a stock that cannot be borrowed, then he must be sure to avoid assignment. For if one is assigned a call, then he too will be short the stock. If the stock cannot be borrowed, the broker will buy him in. Thus, in situations in which the stock might be difficult to borrow, one should use a striking price such that the call is out-of-the-money when sold initially. This will decrease, but not eliminate, the possibility of early assignment.

Leverage is a factor in this strategy also. The short seller would need $2,500 to collateralize this position, assuming that the margin rate is 50%. The option strategist initially only needs 20% of the stock price, plus the call price, less the credit received, for a $1,400 requirement. Moreover, one of the major disadvantages that was mentioned with the synthetic long stock position is not a disadvantage in the synthetic short sale strategy: The option trader does not have to pay out dividends on the options, but the short seller of stock must.

Because of the advantages of the option position in not having to pay out the dividend and also having a slightly larger profit potential from the excess time value premium, it may often be feasible for the trader who is looking to sell stock short to instead sell a call and buy a put. It is also important for the strategist to understand the equivalence between the short stock position and the option position. He might be able to substitute the option position in certain cases when the short sale of stock is normally called for.

SPLITTING THE STRIKES

The strategist may be able to use a slight variation of the synthetic strategy to set up an aggressive, but attractive, position. Rather than using the same striking price for the put and call, he can use a lower striking price for the put and a higher striking price for the call. This action of splitting apart the striking prices gives him some room for error, while still retaining the potential for large profits.

BULLISHLY ORIENTED

If an out-of-the-money put is sold naked, and an out-of-the-money call is simultaneously purchased, an aggressive bullish position is established – often for a credit. If the underlying stock rises far enough, profits can be generated on both the long call and the short put. If the stock remains relatively unchanged, the call purchase will be a loss, but the put sale will be a profit. The risk occurs if the underlying stock drops in price, producing losses on both the short put and the long call.

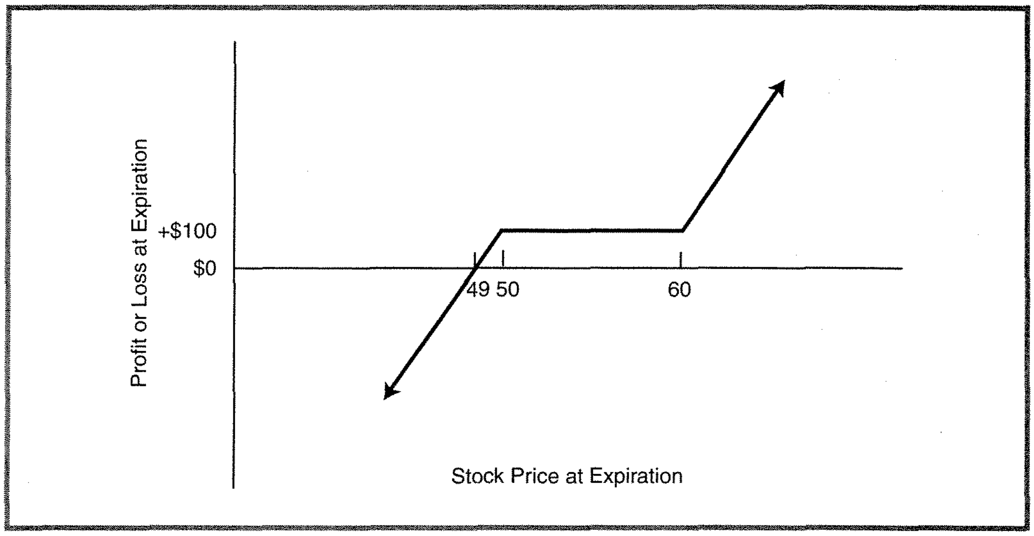
Example: The following prices exist: XYZ is at 53, a January 50 put is selling for 2, and a January 60 call is selling for 1. An investor who is bullish on XYZ sells the January 50 put naked and simultaneously buys the January 60 call. This position brings in a credit of 1 point, less commissions. There is a collateral requirement necessary for the naked put. If XYZ is anywhere between 50 and 60 at January expiration, both options would expire worthless, and the investor would make a small profit equal to the amount of the initial credit received. If XYZ rallies above 60 by expiration, however, his potential profits are unlimited, since he owns the call at 60. His losses could be very large if XYZ should decline well below 50 before expiration, since he has written the naked put at 50. Table 21-3 and Figure 21-1 depict the results at expiration of this strategy.

Essentially, the investor who uses this strategy is bullish on the underlying stock and is attempting to buy an out-of-the-money call for free. If he is moderately wrong

TABLE 21-3.
Bullishly split strikes.

XYZ Price at Expiration	January 50 Put Profit	January 60 Call Profit	Total Profit
40	–$800	–$100	–$ 900
45	– 300	– 100	– 400
50	+ 200	– 100	+ 100
55	+ 200	– 100	+ 100
60	+ 200	– 100	+ 100
65	+ 200	+ 400	+ 600
70	+ 200	+ 900	+ 1,100

FIGURE 21-1.
Bullishly split strikes.



and the underlying stock rallies only slightly or even declines slightly, he can still make a small profit. If he is correct, of course, large profits could be generated in a rally. He may lose heavily if he is very wrong and the stock falls by a large amount instead of rising.

This strategy is often useful when options are overpriced. Suppose that one has a bullish opinion on the underlying stock, yet is dismayed to find that the calls are quite expensive. If he buys one of these expensive calls, he can mitigate the expensiveness somewhat by also *selling* an out-of-the-money put, which is presumably

somewhat expensive also. Thus, if he is right about the bullish attitude on the stock, he owns a call that is more "fairly priced" because its cost was reduced by the amount of the put sale.

BEARISHLY ORIENTED

There is a companion strategy for the investor who is bearish on a stock. He could attempt to buy an out-of-the-money put, giving himself the opportunity for substantial profits in a stock price decline, and could "finance" the purchase of the put by writing an out-of-the-money call naked. The sale of the call would provide profits if the stock stayed below the striking price of the call, but could cost him heavily if the underlying stock rallies too far.

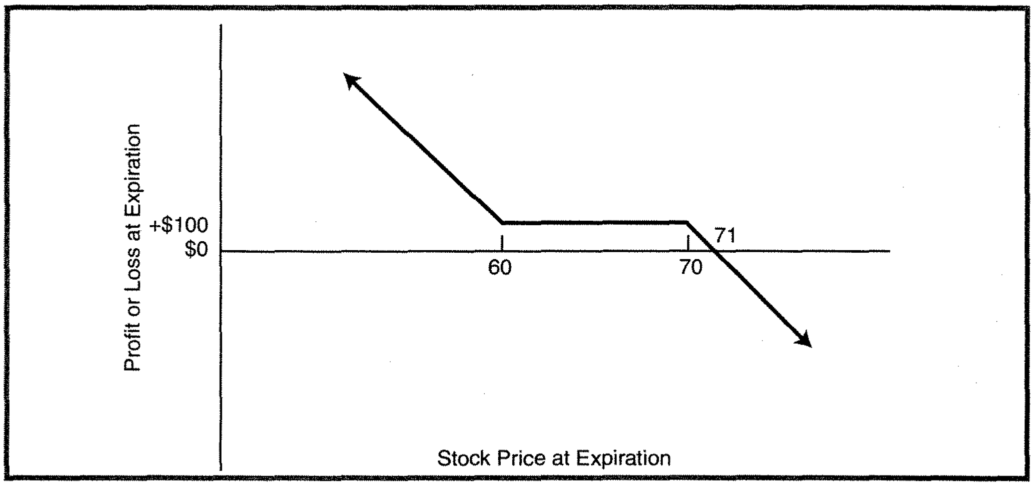
Example: With XYZ at 65, the bearish investor buys a February 60 put for 2 points, and simultaneously sells a February 70 call for 3 points. These trades bring in a credit of 1 point, less commissions. The investor must collateralize the sale of the call. If XYZ should decline substantially by February expiration, large profits are possible because the February 60 put is owned. Even if XYZ does not perform as expected, but still ends up anywhere between 60 and 70 at expiration, the profit will be equal to the initial credit because both options will expire worthless. However, if the stock rallies above 70, unlimited losses are possible because there is a naked call at 70. Table 21-4 and Figure 21-2 show the results of this strategy at expiration.

This is clearly an aggressively bearish strategy. The investor would like to own an out-of-the-money put for downside potential. In addition, he sells an out-of-the-money call, normally for a price greater than that of the purchased put. The call sale

TABLE 21-4.
Bearishly split strikes.

XYZ Price at Expiration	February 60 Put Profit	February 70 Call Profit	Total Profit
50	+$800	+$300	+$1,100
55	+ 300	+ 300	+ 600
60	− 200	+ 300	+ 100
65	− 200	+ 300	+ 100
70	− 200	+ 300	+ 100
75	− 200	− 200	− 400
80	− 200	− 700	− 900

FIGURE 21-2.
Bearishly split strikes.



essentially lets him own the put for free. In fact, he can still make profits even if the underlying stock rises slightly or only falls slightly. His risk is realized if the stock rises above the striking price of the written call.

This strategy of splitting the strikes in a bearish manner is used very frequently in conjunction with the ownership of common stock. That is, a stock owner who is looking to protect his stock will buy an out-of-the-money put and sell an out-of-the-money call to finance the put purchase. This strategy is called a "protective collar" and was discussed in more detail in the chapter on Put Buying in Conjunction with Common Stock Ownership. A strategy that is similar to these, but modifies the risk, is presented in Chapter 23, Spreads Combining Calls and Puts.

SUMMARY

In either of these aggressive strategies, *the investor must have a definite opinion about the future price movement of the underlying stock.* He buys an out-of-the-money option to provide profit potential for that stock movement. However, an investor can lose the entire purchase proceeds of an out-of-the-money option if the stock does not perform as expected. An aggressive investor, who has sufficient collateral, might attempt to counteract this effect by also writing an out-of-the-money option to cover the cost of the option that he bought. Then, he will not only make money if the stock performs as expected, but he will also make money if the stock remains relatively unchanged. He will lose quite heavily, however, if the underlying stock goes in the opposite direction from his original anticipation. That is why he must have a definite opinion on the stock and also be fairly certain of his timing.

CHAPTER 22

Basic Put Spreads

Put spreading strategies do not differ substantially in theory from their accompanying call spread strategies. Both bullish and bearish positions can be constructed with put spreads, as was also the case with call spreads. However, because puts are more oriented toward downward stock movement than calls are, some bearish put spread strategies are superior to their equivalent bearish call spread strategies.

The three simplest forms of option spreads are:

1. the bull spread,
2. the bear spread, and
3. the calendar spread.

The same types of spreads that were constructed with calls can be established with puts, but there are some differences.

BEAR SPREAD

In a call bear spread, a call with a lower striking price was sold while a call at a higher striking price was bought. Similarly, *a put bear spread is established by selling a put at a lower strike while buying a put at a higher strike.* The put bear spread is a debit spread. This is true because a put with a higher striking price will sell for more than a put with a lower striking price. Thus, on a stock with both puts and calls trading, one could set up a bear spread for a credit (using calls) or alternatively set one up for a debit (using puts):

Put Bear Spread	Call Bear Spread
Buy XYZ January 60 put	Buy XYZ January 60 call
Sell XYZ January 50 put	Sell XYZ January 50 call
(debit spread)	(credit spread)

The put bear spread has the same sort of profit potential as the call bear spread. There is a limited maximum potential profit, and this profit would be realized if XYZ were below the lower striking price at expiration. The put spread would widen, in this case, to equal the difference between the striking prices. The maximum risk is also limited, and would be realized if XYZ were anywhere above the higher striking price at expiration.

Example: The following prices exist:

XYZ common, 55;

XYZ January 50 put, 2; and

XYZ January 60 put, 7.

Buying the January 60 put and selling the January 50 would establish a bear spread for a 5-point debit. Table 22-1 will help verify that this is indeed a bearish position. The reader will note that Figure 22-1 has the same shape as the call bear spread's graph (Figure 8-1). The investment required for this spread is the net debit, and it must be paid in full. Notice that *the maximum profit potential is realized anywhere below 50 at expiration, and the maximum risk potential is realized anywhere above 60 at expiration.* The maximum risk is always equal to the initial debit required to establish the spread plus commissions. The break-even point is 55 in this example. The following formulae allow one to quickly compute the meaningful statistics regarding a put bear spread.

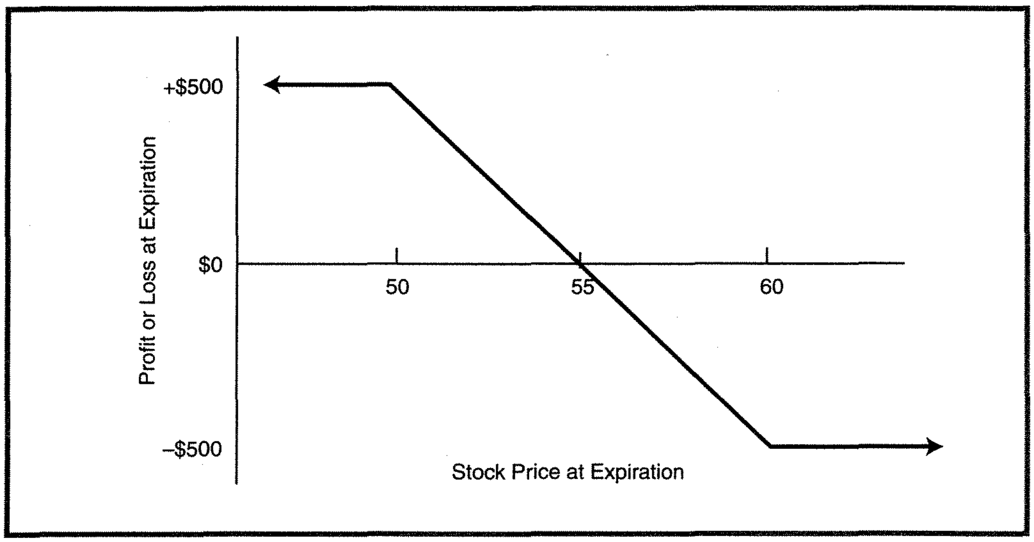
Maximum risk = Initial debit
Maximum profit = Difference between strikes – Initial debit
Break-even price = Higher striking price – Initial debit

Put bear spreads have an advantage over call bear spreads. With puts, one is selling an out-of-the-money option when setting up the spread. Thus, *one is not risking early exercise of his written option before the spread becomes profitable.* For the written put to be in-the-money, and thus in danger of being exercised, the spread would have to be profitable, because the stock would have to be below the lower striking price. Such is not the case with call bear spreads. In the call spread, one sells an in-the-money call as part of the bear spread, and thus could be at risk of early exercise before the spread has a chance to become profitable.

TABLE 22-1.
Put bear spread.

XYZ Price at Expiration	January 50 Put Profit	January 60 Put Profit	Total Profit
40	–$800	+$1,300	+$500
45	– 300	+ 800	+ 500
50	+ 200	+ 300	+ 500
55	+ 200	– 200	0
60	+ 200	– 700	– 500
70	+ 200	– 700	– 500
80	+ 200	– 700	– 500

FIGURE 22-1.
Put bear spread.



Beside this difference in the probability of early exercise, the put bear spread holds another advantage over the call bear spread. *In the put spread, if the underlying stock drops quickly, thereby making both options in-the-money, the spread will normally widen quickly as well.* This is because, as has been mentioned previously, put options tend to lose time value premium rather quickly when they go into-the-money. In the example above, if XYZ rapidly dropped to 48, the January 60 put would be near 12, retaining very little time premium. However, the January 50 put that is short would also not retain much time value premium, perhaps selling at 4 points or

so. Thus, the spread would have widened to 8 points. Call bear spreads often do not produce a similar result on a short-term downward movement. Since the call spread involves being short a call with a lower striking price, this call may actually pick up time value premium as the stock falls close to the lower strike. Thus, even though the call spread might have a similar profit at expiration, it often will not perform as well on a quick downward movement.

For these two reasons – less chance of early exercise and better profits on a short-term movement – the put bear spread is superior to the call bear spread. Some investors still prefer to use the call spread, since it is established for a credit and thus does not require a cash investment. This is a rather weak reason to avoid the superior put spread and should not be an overriding consideration. Note that the margin requirement for a call bear spread will result in a reduction of one's buying power by an amount approximately equal to the debit required for a similar put bear spread. (The margin required for a call bear spread is the difference between the striking prices less the credit received from the spread.) Thus, the only accounts that gain any substantial advantage from a credit spread are those that are near the minimum equity requirement to begin with. For most brokerage firms, the minimum equity requirement for spreads is $2,000.

BULL SPREAD

A bull spread can be established with put options by buying a put at a lower striking price and simultaneously selling a put with a higher striking price. This, again, is the same way a bull spread was constructed with calls: selling the higher strike and buying the lower strike.

Example: The same prices can be used:

XYZ common, 55;

XYZ January 50 put, 2; and

XYZ January 60 put, 7.

The bull spread is constructed by buying the January 50 put and selling the January 60 put. This is a credit spread. The credit is 5 points in this example. If the underlying stock advances by January expiration and is anywhere above 60 at that time, the maximum profit potential of the spread will be realized. In that case, with XYZ anywhere above 60, both puts would expire worthless and the spreader would make a profit of the entire credit – 5 points in this example. Thus, *the maximum profit potential is limited, and the maximum profit occurs if the underlying stock rises in price*

above the higher strike. These are the same qualities that were displayed by a call bull spread (Chapter 7). The name "bull spread" is derived from the fact that this is a bullish position: The strategist wants the underlying stock to rise in price.

The risk is limited in this spread. If the underlying stock should decline by expiration, the maximum loss will be realized with XYZ anywhere below 50 at that time. The risk is 5 points in this example. To see this, note that if XYZ were anywhere below 50 at expiration, the differential between the two puts would widen to 10 points, since that is the difference between their striking prices. Thus, the spreader would have to pay 10 points to buy the spread back, or to close out the position. Since he initially took in a 5-point credit, this means his loss is equal to 5 points – the 10-point cost of closing out less the 5 points he received initially.

The investment required for a bullish put spread is actually a collateral requirement, since the spread is a credit spread. The amount of collateral required is equal to the difference between the striking prices less the net credit received for the spread. In this example, the collateral requirement is $500 – the $1,000, or 10-point, differential in the striking prices less the $500 credit received from the spread. Note that *the maximum possible loss is always equal to the collateral requirement in a bullish put spread.*

It is not difficult to calculate the break-even point in a bullish spread. In this example, the break-even point before commissions is 55 at expiration. With XYZ at 55 in January, the January 50 put would expire worthless and the January 60 put would have to be bought back for 5 points. It would be 5 points in-the-money with XYZ at 55. Thus, the spreader would break even, since he originally received 5 points credit for the spread and would then pay out 5 points to close the spread. The following formulae allow one to quickly compute the details of a bullish put spread:

Maximum potential risk = Initial collateral requirement
= Difference in striking prices – Net credit received
Maximum potential profit = Net credit
Break-even price = Higher striking price – Net credit

CALENDAR SPREAD

In a calendar spread, a near-term option is sold and a longer-term option is bought, both with the same striking price. This definition applies to either a put or a call calendar spread. In Chapter 9, it was shown that there were two philosophies available for call calendar spreads, either neutral or bullish. Similarly, there are two philosophies available for put calendar spreads: neutral or bearish.

In a neutral calendar spread, one sets up the spread with the idea of closing the spread when the near-term call or put expires. In this type of spread, the maximum profit will be realized if the stock is exactly at the striking price at expiration. The spreader is merely attempting to capitalize on the fact that the time value premium disappears more rapidly from a near-term option than it does from a longer-term one.

Example: XYZ is at 50 and a January 50 put is selling for 2 points while an April 50 put is selling for 3 points. A neutral calendar spread can be established for a 1-point debit by selling the January 50 put and buying the April 50 put. The investment required for this position is the amount of the net debit, and it must be paid for in full. If XYZ is exactly at 50 at January expiration, the January 50 put will expire worthless and the April 50 put will be worth about 2 points, assuming other factors are the same. The neutral spreader would then sell the April 50 put for 2 points and take his profit. The spreader's profit in this case would be one point before commissions, because he originally paid a 1-point debit to set up the spread and then liquidates the position by selling the April 50 put for 2 points. Since commission costs can cut into available profits substantially, spreads should be established in a large enough quantity to minimize the percentage cost of commissions. This means that at least 10 spreads should be set up initially.

In any type of calendar spread, *the risk is limited to the amount of the net debit.* This maximum loss would be realized if the underlying stock moved substantially far away from the striking price by the time the near-term option expired. If this happened, both options would trade at nearly the same price and the differential would shrink to practically nothing, the worst case for the calendar spreader. For example, if the underlying stock drops substantially, say to 20, both the near-term and the long-term put would trade at nearly 30 points. On the other hand, if the underlying stock rose substantially, say to 80, both puts would trade at a very low price, say $1/16$ or $1/8$, and again the spread would shrink to nearly zero.

Neutral call calendar spreads are generally superior to neutral put calendar spreads. Since the amount of time value premium is usually greater in a call option (unless the underlying stock pays a large dividend), the spreader who is interested in selling time value would be better off utilizing call options.

The second philosophy of calendar spreading is a more aggressive one. *With put options, a bearish strategy can be constructed using a calendar spread.* In this case, one would establish the spread with out-of-the-money puts.

Example: With XYZ at 55, one would sell the January 50 put for 1 point and buy the April 50 put for $1\frac{1}{2}$ points. He would then like the underlying stock to remain above the striking price until the near-term January put expires. If this happens, he would

make the 1-point profit from the sale of that put, reducing his net cost for the April 50 put to ½ point. Then, he would become bearish, hoping for the underlying stock to decline in price substantially before April expiration in order that he might be able to generate large profits on the April 50 put he holds.

Just as the bullish calendar spread with calls can be a relatively attractive strategy, so can the bearish calendar spread with puts. Granted, two criteria have to be fulfilled in order for the position to work to the optimum: The near-term put must expire worthless, and then the underlying stock must drop in order to generate profits on the long side. Although these conditions may not occur frequently, one profitable situation can more than make up for several losing ones. This is true because the initial debit for a bearish calendar spread is small, ½ point in the example above. Thus, the losses will be small and the potential profits could be very large if things work out right.

The aggressive spreader must be careful not to "leg out" of his spread, since he could generate a large loss by doing so. The object of the strategy is to accept a rather large number of small losses, with the idea that the infrequent large profits will more than offset the sum of the losses. If one generates a large loss somewhere along the way, this may ruin the overall strategy. Also, if the underlying stock should fall to the striking price before the near-term put expires, the spread will normally have widened enough to produce a small profit; that profit should be taken by closing the spread at that time.

CHAPTER 23

Spreads Combining Calls and Puts

Certain types of spreads can be constructed that utilize both puts and calls. One of these strategies has been discussed before: the butterfly spread. However, other strategies exist that offer potentially large profits to the spreader. These other strategies are all variations of calendar spreads and/or straddles that involve both put and call options.

THE BUTTERFLY SPREAD

This strategy has been described previously, although its usage in Chapter 10 was restricted to constructing the spread with calls. Recall that the butterfly spread is a neutral position that has limited risk as well as limited profits. The position involves three striking prices, utilizing a bull spread between the lower two strikes and a bear spread between the higher two strikes. The maximum profit is realized at the middle strike at expiration, and the maximum loss is realized if the stock is above the higher strike or below the lower strike at expiration.

Since either a bull spread or a bear spread can be constructed with puts or calls, it should be obvious that a butterfly spread (consisting of both a bull spread and a bear spread) can be constructed in a number of ways. In fact, there are four ways in which the spread can be established. If option prices are fairly balanced – that is, the arbitrageurs are keeping prices in line – any of the four ways will have the same potential profits and losses at expiration of the options. However, because of the ways in which puts and calls behave prior to their expiration, certain advantages or disad-

vantages are connected with some of the methods of establishing the butterfly spread.

Example: The following prices exist:

XYZ common: 60			
Strike:	50	60	70
Call:	12	6	2
Put:	1	5	11

The method using only the calls indicates that one would buy the 50 call, sell two 60 calls, and buy the 70 call. Thus, there would be a bull spread in the calls between the 50 and 60 strikes, and a bear spread in the calls between the 60 and 70 strikes. In a similar manner, one could establish a butterfly spread by combining either type of bull spread between the 50 and 60 strikes with any type of bear spread between the 60 and 70 strikes. Some of these spreads would be credit spreads, while others would be debit spreads. In fact, one's personal choice between two rather equivalent makeups of the butterfly spread might be decided by whether there were a credit or a debit involved.

Table 23-1 summarizes the four ways in which the butterfly spread might be constructed. In order to verify the debits and credits listed, the reader should recall that a bull spread consists of buying a lower strike and selling a higher strike, whether puts or calls are used. Similarly, bear spreads with either puts or calls consist of buying a higher strike and selling a lower strike. Note that the third choice – bull spread with puts and bear spread with calls – is a short straddle protected by buying the out-of-the-money put and call.

In each of the four spreads, the maximum potential profit at expiration is 8 points if the underlying stock is exactly at 60 at that time. The maximum possible loss in any of the four spreads is 2 points, if the stock is at or above 70 at expiration or is at or below 50 at expiration. For example, either the top line in the table, where the spread is set up only with calls; or the bottom line, where the spread is set up only with puts, has a risk equal to the debit involved – 2 points. The large-debit spread (second line of table) will be able to be liquidated for a minimum of 10 points at expiration no matter where the stock is, so the risk is also 2 points. (It cost 12 points to begin with.) Finally, the credit combination (third line) has a maximum buy-back of 10 points, so it also has risk of 2 points. In addition, since the striking prices are 10 points apart, the maximum potential profit is 8 points (maximum profit = striking price differential minus maximum risk) in all the cases.

TABLE 23-1.
Butterfly spread.

Bull Spread (Buy Option at 50,...plus... Sell at 60)	Bear Spread (Buy Option at 70, Sell at 60)	Total Money
Calls (6 debit)	Calls (4 credit)	2 debit
Calls (6 debit)	Puts (6 debit)	12 debit
Puts (4 credit)	Calls (4 credit)	8 credit
Puts (4 credit)	Puts (6 debit)	2 debit

The factor that causes all these combinations to be equal in risk and reward is the arbitrageur. If put and call prices get too far out of line, the arbitrageur can take riskless action to force them back. This particular form of arbitrage, known as the box spread, is described later, in Chapter 27, Arbitrage.

Even though all four ways of constructing the butterfly spread are equal at expiration, some are superior to others for certain price movements prior to expiration. Recall that it was previously stated that bull spreads are best constructed with calls, and bear spreads are best constructed with puts. Since the butterfly spread is merely the combination of a bull spread and a bear spread, the best way to set up the butterfly spread is to use calls for the bull spread and puts for the bear spread. This combination is the one listed on the second line of Table 23-1. This strategy involves the largest debit of the four combinations and, as a result, many investors shun this approach. However, all the other combinations involve selling an in-the-money put or call at the outset, a situation that could lead to early exercise. The reader may also recall that the credit combination, listed on the third line of Table 23-1, was previously described as a protected straddle position. That is, one sells a straddle and simultaneously buys both an out-of-the-money put and an out-of-the-money call with the same expiration month, as protection for the straddle. Thus, a butterfly spread is actually the equivalent of a completely protected straddle write.

A butterfly spread is not an overly attractive strategy, although it may be useful from time to time. The commissions required are extremely high, and there is no chance of making a large profit on the position. The limited risk feature is good to have in a position, but it alone cannot compensate for the less attractive features of the strategy. Essentially, the strategist is looking for the stock to remain in a neutral pattern until the options expire. If the potential profit is at least three times the maximum risk (and preferably four times) and the underlying stock appears to be in trading range, the strategy is feasible. Otherwise, it is not.

COMBINING AN OPTION PURCHASE AND A SPREAD

It is possible to combine the purchase of a call and a credit put spread to produce a position that behaves much like a call buy, although it has less risk over much of the profit range. This strategy is often used when one has a quite bullish opinion regarding the underlying security, yet the call one wishes to purchase is "overpriced." In a similar manner, if one is *bearish* on the underlying, he can sometimes combine the purchase of a put with the sale of a call credit spread. Both approaches are described in this section.

THE BULLISH SCENARIO

It sometimes happens that one arrives at a bullish opinion regarding a stock, only to find that the options are very expensive. In fact, they may be so expensive as to preclude thoughts of making an outright call purchase. This might happen, for example, if the stock has suddenly plummeted in price (perhaps during an ongoing, rapid bearish move by the overall stock market). To buy calls at this time would be overly risky. If the underlying began to rally, it would often be the case that the implied volatility of the calls would shrink, thus harming one's long call position.

As a counter to this, it might make sense to buy the call, but at the same time to sell a put credit spread. Recall that a put credit spread is a bullish strategy. Moreover, since it is presumed that the options are expensive on this particular stock, the puts being used in the spread would be expensive as well. Thus, the credit received from the spread would be slightly larger than "normal" because the options are expensive.

Example: XYZ is selling at 100. One wishes to purchase the December 100 call as an outright bullish speculation. That call is selling for 10. However, one determines that the December 100 call is overpriced at these levels. (In order to make this determination, one would use an option model whose techniques are described in Chapter 28 on mathematical applications.) Hence, he decides to use the following put spread *in addition to buying the December 100 call:*

Sell December 90 put, 6

Buy December 80 put, 3

The sale of the put spread brings in a 3-point credit. Thus, his total expenditure for the entire position is 7 points (10 for the December 100 call, less 3 credit from the sale of the put spread). If one is correct about his bullish outlook for the stock (i.e., the stock goes up), he can in some sense consider that he paid 7 for the call. Another way

to look at it is this: The sale of the put spread reduces the call price down to a more moderate level, one that might be in line with its "theoretical value." In other words, the call would not be considered expensive if it were priced at 7 instead of 10. The sale of the put spread can be considered a way to reduce the overall cost of the call.

Of course, the sale of the put spread brings some extra risk into the position because, if the stock were to fall dramatically, the put spread could lose 7 points (the width of the strikes in the spread, 10 points, less the initial credit received, 3 points). This, added to the call's cost of 10 points, means that the entire risk here is 17 points. In fact, that is the margin required for this spread as well. Thus, the overall spread still has limited risk, because both the call purchase and the put credit spread are limited-risk strategies. However, the total risk of the two combined is larger than for either one separately.

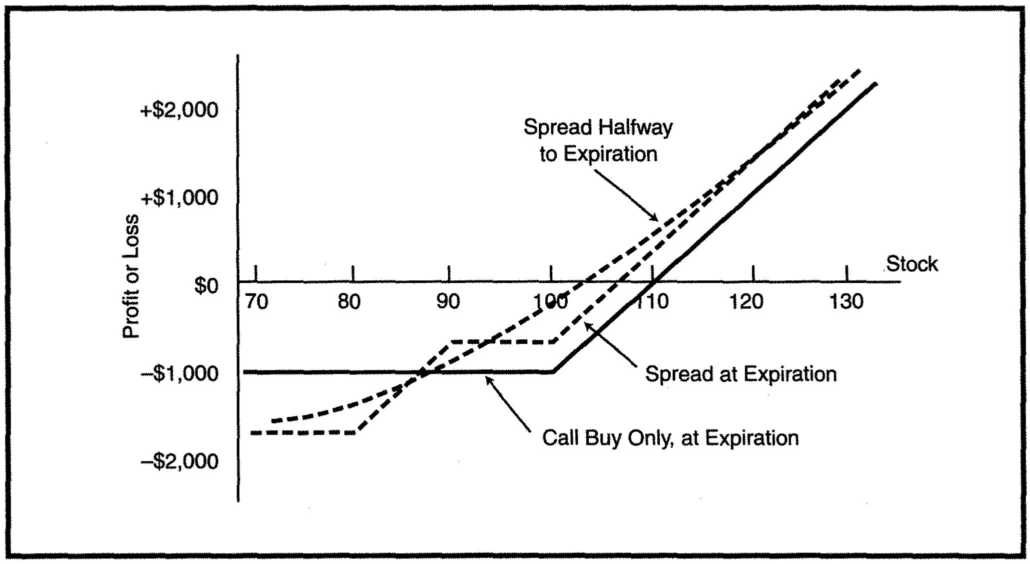
Remember that one must be bullish on the underlying in order to employ this strategy. So, if his analysis is correct, the upside is what he wants to maximize. If he is wrong on his outlook for the stock, then he needs to employ some sort of stop-loss measures before the maximum risk of the position is realized.

The resulting position is shown in Figure 23-1, along with two other plots. The straight line marked "Spread at expiration" shows how the profitability of the call purchase combined with a bull spread would look at December expiration. In addition, there is a plot with straight lines of the purchase of the December 100 call for 10 points. That plot can be compared with the three-way spread to see where extra risk and reward occur. Note that the three-way spread does better than the outright purchase of the December 100 call as long as the stock is higher than 87 at expiration. Since the stock is initially at 100 and since one is initially bullish on the stock, one would have to surmise that the odds of it falling to 87 are fairly small. Thus, the three-way spread outperforms the outright purchase of the call over a large range of stock prices.

The final plot in Figure 23-1 is that of the three-way spread's profit and losses *halfway* to the expiration date. You can see that it looks much like the profitability of merely owning a call: The curve has the same shape as the call pricing curve shown in Chapter 1.

Hence, this three-way strategy can often be more attractive and more profitable than merely owning a call option. Remember, though, that it *does* increase risk and require a larger collateral deposit than the outright purchase of the at-the-money call would. One can experiment with this strategy, too, in that he might consider buying an out-of-the-money call and selling a put spread that brings in enough credit to completely pay for the call. In that way, he would have no risk as long as the stock remained above the higher striking price used in the put credit spread.

FIGURE 23-1.
Call buy and put credit (bull) spread.



THE BEARISH SCENARIO

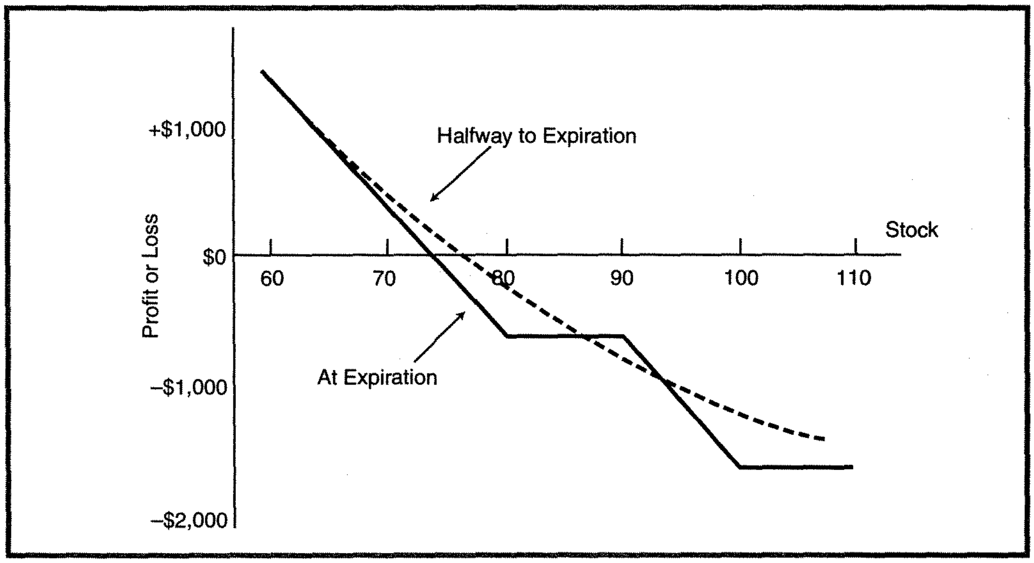
In a similar manner, one can construct a position to take advantage of a bearish opinion on a stock. Again, this would be most useful when the options were overpriced and one felt that an at-the-money put was too expensive to purchase by itself.

Example: XYZ is trading at 80, and one has a definite bearish opinion on the stock. However, the December 80 put, which is selling for 8, is expensive according to an option analysis. Therefore, one might consider *selling* a call credit spread (out-of-the-money) to help reduce the cost of the put. The entire position would thus be:

Buy 1 December 80 put:	8 debit
Sell 1 December 90 call:	4 credit
Buy 1 December 100 call:	2 debit
Total cost:	**6 debit ($600)**

The profitability of this position is shown in Figure 23-2. The straight line on that graph shows how the position would behave at expiration. The introduction of the call credit spread has increased the risk to $1,600 if the stock should rally to 100 or higher by expiration. Note that the risk is limited since both the put purchase and the call credit spread are limited-risk strategies. The margin required would be this maximum risk, or $1,600.

FIGURE 23-2.
Put buy and call credit (bear) spread.



The curved line on Figure 23-2 shows how the three-way spread would behave if one looked at it halfway to its expiration date. In that case, it has a curved appearance much like the outright purchase of a put option.

Thus, this strategy could be appealing to bearishly-oriented traders, especially when the options are expensive. It might have certain advantages over an outright put purchase in that case, but it *does* require a larger margin investment and has theoretically larger risk.

A SIMPLE FOLLOW-UP ACTION FOR BULL OR BEAR SPREADS

Another way of combining puts and calls in a spread can sometimes be used when one has a bull or bear spread already in place. Suppose that one owns a call bull spread and the underlying stock has advanced nicely. In fact, it is above *both* of the strikes used in the spread. However, as is often the case, the bull spread may not have widened out to its maximum profit potential. One can use the puts for two purposes at this point: (1) to determine whether the call spread is trading at a "reasonable" value, and (2) to try to lock in some profits. First, let's look at an example of the "reasonable value" verification.

Example: A trader buys an XYZ call bull spread for 5 points. The spread uses the January 70 calls and the January 80 calls. Later, XYZ advances to a price of 88, but there is still a good deal of time remaining in the options. Perhaps the spread has widened out only to 7 points at that time. The trader finds it somewhat disappointing that the spread has not widened out to its maximum profit potential of 10 points. However, this is a fairly common occurrence with bull and bear spreads, and is one of the factors that may make them less attractive than outright call or put purchases.

In any case, suppose the following prices exist:

January 80 put, 5

January 70 put, 2

We can use these put prices to verify that the call spread is "in line." Notice that the put spread is 3 points and the call spread is 7 points (both are the January 70–January 80 spread). Thus, they add up to 10 points – the width of the strikes. When that occurs, we can conclude that the spreads are "in line" and are trading at theoretically correct prices.

Knowing this information doesn't help one make any more profits, but it does provide some verification of the prices. Many times, one feels frustrated when he sees that a call bull spread has not widened out as he expected it to. Using the put spread as verification can help keep the strategist "on track" so that he makes rational, not emotional, decisions.

Now let's look at a similar example, in which perhaps the puts can be used to lock in profits on a call bull spread.

Example: Using the same bull spread as in the previous example, suppose that one owns an XYZ call bull spread, having bought the January 70 call and sold the January 80 call for a debit of 5 points. Now assume it is approaching expiration, and the stock is once again at 88. At this time, the spread is theoretically nearing its maximum price of 10. However, since both calls are fairly deeply in-the-money, the market-makers are making very wide spreads in the calls. Perhaps these are the markets, *with the stock at 88 and only a week or two remaining until expiration:*

Call	Bid Price	Asked Price
January 70 call	17.50	18.50
January 80 call	8.80	8.20

If one were to remove this spread at market prices, he would sell his long January 70 call for 17.50 and would buy his short January 80 call back for 8.20, a cred-

it of 9.30. Since the maximum value of the spread is 10, one is giving away 70 cents, quite a bit for just such a short time remaining.

However, suppose that one looks at the puts and finds these prices:

Put	Bid Price	Asked Price
January 80 put	0.20	0.40
January 70 put	none	0.10

One could "lock in" his call spread profits by buying the January 80 put for 40 cents. Ignoring commissions for a moment, if he bought that put and then held it *along with* the call spread until expiration, he would unwind the call spread for a 10 credit at expiration. He paid 40 cents for the put, so his net credit to exit the spread would be 9.60 – considerably better than the 9.30 he could have gotten above for the call spread alone.

This put strategy has one big advantage: If the underlying stock should suddenly collapse and tumble beneath 70 – admittedly, a remote possibility – large profits could accrue. The purchase of the January 80 put has protected the bull spread's profits at all prices. But below 70, the put starts to make *extra* money, and the spreader could profit handsomely. Such a drop in price would only occur if some materially damaging news surfaced regarding XYZ Company, but it *does* occasionally happen.

If one utilizes this strategy, he needs to carefully consider his commission costs and the possibility of early assignment. For a professional trader, these are irrelevant, and so the professional trader should endeavor to exit bull spreads in this manner whenever it makes sense. However, if the public customer allows stock to be assigned at 80 and exercises to buy stock at 70, he will have two stock commissions plus one put option commission. That should be compared to the cost of two in-the-money call option commissions to remove the call spread directly. Furthermore, if the public customer receives an early assignment notice on the short January 80 calls, he may need to provide day-trade margin as he exercises his January 70 calls the next day.

Without going into as much detail, a bear spread's profits can be locked in via a similar strategy. Suppose that one owns a January 60 put and has sold a January 50 put to create a bear spread. Later, with the stock at 45, the spreader wants to remove the spread, but again finds that the markets for the in-the-money puts are so wide that he cannot realize anywhere near the 10 points that the spread is theoretically worth. He should then see what the January 50 *call* is selling for. If it is fractionally priced, as it most likely will be if expiration is drawing nigh, then it can be purchased to lock in the profits from the put spread. Again, commission costs should be considered by the public customer before finalizing his strategy.

THREE USEFUL BUT COMPLEX STRATEGIES

The three strategies presented in this section are all designed to limit risk while allowing for large potential profits if correct market conditions develop. Each is a combination strategy – that is, it involves both puts and calls – and each is a calendar strategy, in which near-term options are sold and longer-term options are bought. (A fourth strategy that is similar in nature to those about to be discussed is presented in the next chapter.) Although all of these are somewhat complex and are for the most advanced strategist, they do provide attractive risk/reward opportunities. In addition, the strategies can be employed by the public customer; they are not designed strictly for professionals. All three strategies are described conceptually in this section; specific selection criteria are presented in the next section.

A TWO-PRONGED ATTACK (THE CALENDAR COMBINATION)

A bullish calendar spread was shown to be a rather attractive strategy. A bullish call calendar spread is established with out-of-the-money calls for a relatively small debit. If the near-term call expires worthless and the stock then rises substantially before the longer-term call expires, the profits could potentially be large. In any case, the risk is limited to the small debit required to establish the spread. In a similar manner, the bearish calendar spread that uses put options can be an attractive strategy as well. In this strategy, one would set up the spread with out-of-the-money puts. He would then want the near-term put to expire worthless, followed by a substantial drop in the stock price in order to profit on the longer-term put.

Since both strategies are attractive by themselves, the combination of the two should be attractive as well. That is, *with a stock midway between two striking prices, one might set up a bullish out-of-the-money call calendar spread and simultaneously establish a bearish out-of-the-money put calendar spread.* If the stock remains relatively stable, both near-term options would expire worthless. Then a substantial stock price movement *in either direction* could produce large profits. With this strategy, the spreader does not care which direction the stock moves after the near options expire worthless; he only hopes that the stock becomes volatile and moves a large distance in either direction.

Example: Suppose that the following prices exist three months before the January options expire:

XYZ common: 65			
January 70 call:	3	January 60 put:	2
April 70 call:	5	April 60 put:	3

The bullish portion of this combination of calendar spreads would be set up by selling the shorter-term January 70 call for 3 points and simultaneously buying the longer-term April 70 call for 5 points. This portion of the spread requires a 2-point debit. The bearish portion of the spread would be constructed using the puts. The near-term January 60 put would be sold for 2 points, while the longer-term April 60 put would be bought for 3. Thus, the put portion of the spread is a 1-point debit. Overall, then, the combination of the calendar spreads requires a 3-point debit, plus commissions. This debit is the required investment; no additional collateral is required. Since there are four options involved, the commission cost will be large. Again, establishing the spreads in quantity can reduce the percentage cost of commissions.

Note that all the options involved in this position are initially out-of-the-money. The stock is below the striking price of the calls and is above the striking price of the puts. One has sold a near-term put and call combination and purchased a longer-term combination. For nomenclature purposes, this strategy is called a "calendar combination."

There are a variety of possible outcomes from this position. First, it should be understood that *the risk is limited to the amount of the initial debit,* 3 points in this example. If the underlying stock should rise dramatically or fall dramatically before the near-term options expire, both the call spread and the put spread will shrink to nearly nothing. This would be the least desirable result. In actual practice, the spread would probably have a small positive differential left even after a premature move by the underlying stock, so that the probability of a loss of the entire debit would be small.

If the near-term options both expire worthless, a profit will generally exist at that time.

Example: If XYZ were still at 65 at January expiration in the prior example, the position should be profitable at that time. The January call and put would expire worthless with XYZ at 65, and the April options might be worth a total of 5 points. The spread could thus be closed for a profit with XYZ at 65 in January, since the April options could be sold for 5 points and the initial "cost" of the spread was only 3 points. Although commissions would substantially reduce this 2-point gross profit, there would still be a good percentage profit on the overall position. If the strategist decides to take his profit at this time, he would be operating in a conservative manner.

However, the strategist may want to be more aggressive and hold onto the April combination in hopes that the stock might experience a substantial movement before those options expire. Should this occur, *the potential profits could be quite large.*

Example: If the stock were to undergo a very bullish move and rise to 100 before April expiration, the April 70 call could be sold for 30 points. (The April 60 put would expire worthless in that case.) Alternatively, if the stock plunged to 30 by April expiration, the put at 60 could be sold for 30 points while the call expired worthless. In either case, the strategist would have made a substantial profit on his initial 3-point investment.

It may be somewhat difficult for the strategist to decide what he wants to do after the near-term options expire worthless. He may be torn between taking the limited profit that is at hand or holding onto the combination that he owns in hopes of larger profits. A reasonable approach for the strategist to take is to do nothing immediately after the near-term options expire worthless. He can hold the longer-term options for some time before they will decay enough to produce a loss in the position. Referring again to the previous example, when the January options expire worthless, the strategist then owns the April combination, which is worth 5 points at that time. He can continue to hold the April options for perhaps 6 or 8 weeks before they decay to a value of 3 points, even if the stock remains close to 65. At this point, the position could be closed for a net loss of the commission costs involved in the various transactions.

As a general rule, one should be willing to hold the combination, even if this means that he lets a small profit decay into a loss. The reason for this is that *one should give himself the maximum opportunity to realize large profits.* He will probably sustain a number of small losses by doing this, but by giving himself the opportunity for large profits, he has a reasonable chance of having the profits outdistance the losses.

There is a time to take small profits in this strategy. This would be when either the puts or the calls were slightly in-the-money as the near-term options expire.

Example: If XYZ moved to 71 just as the January options were expiring, the call portion of the spread should be closed. The January 70 call could be bought back for 1 point and the April 70 call would probably be worth about 5 points. Thus, the call portion of the spread could be "sold" for 4 points, enough to cover the entire cost of the position. The April 60 put would not have much value with the stock at 71, but it should be held just in case the stock should experience a large price decline. Similar results would occur on the put side of the spread if the underlying stock were slightly in-the-money, say at 58 or 59, at January expiration. At no time does the strategist want to risk being assigned on an option that he is short, so he must always close the portion of the position that is in-the-money at near-term expiration. This is only necessary, of course, if the stock has risen above the striking price of the calls or has fallen below the striking price of the puts.

In summary, this is a reasonable strategy if one operates it over a period of time long enough to encompass several market cycles. The strategist must be careful not to place a large portion of his trading capital in the strategy, however, since even though the losses are limited, they still represent his entire net investment. A variation of this strategy, whereby one sells more options than he buys, is described in the next chapter.

THE CALENDAR STRADDLE

Another strategy that combines calendar spreads on both put and call options can be constructed by selling a near-term straddle and simultaneously purchasing a longer-term straddle. Since the time value premium of the near-term straddle will decrease more rapidly than that of the longer-term straddle, one could make profits on a limited investment. This strategy is somewhat inferior to the one described in the previous section, but it is interesting enough to examine.

Example: Suppose that three months before January expiration, the following prices exist:

XYZ common: 40	
January 40 straddle: 5	April 40 straddle: 7

A calendar spread of the straddles could be established by selling the January 40 straddle and simultaneously buying the April 40 straddle. This would involve a cost of 2 points, or the debit of the transaction, plus commissions.

The risk is limited to the amount of this debit *up until the time the near-term straddle expires.* That is, even if XYZ moves up in price by a substantial amount or declines in price by a substantial amount, the worst that can happen is that the difference between the straddle prices shrinks to zero. This could cause one to lose an amount equal to his original debit, plus commissions. *This limit on the risk applies only until the near-term options expire.* If the strategist decides to buy back the near-term straddle and continue to hold the longer-term one, his risk then increases by the cost of buying back the near-term straddle.

Example: XYZ is at 43 when the January options expire. The January 40 call can now be bought back for 3 points. The put expires worthless; so the whole straddle was closed out for 3 points. The April 40 straddle might be selling for 6 points at that time. If the strategist wants to hold on to the April straddle, in hopes that the stock might experience a large price swing, he is free to do so after buying back the January

40 straddle. However, he has now invested a total of 5 points in the position: the original 2-point debit plus the 3 points that he paid to buy back the January 40 straddle. Hence, his risk has increased to 5 points. If XYZ were to be at exactly 40 at April expiration, he would lose the entire 5 points. While the probability of losing the entire 5 points must be considered small, there is a substantial chance that he might lose more than 2 points – his original debit. Thus, he has increased his risk by buying back the near-term straddle and continuing to hold the longer-term one.

This is actually a neutral strategy. Recall that when calendar spreads were discussed previously, it was pointed out that one establishes a neutral calendar spread with the stock near the striking price. This is true for either a call calendar spread or a put calendar spread. This strategy – a calendar spread with straddles – is merely the combination of a neutral call calendar spread and a neutral put calendar spread. Moreover, recall that the neutral calendar spreader generally establishes the position with the intention of closing it out once the near-term option expires. He is mainly interested in selling time in an attempt to capitalize on the fact that a near-term option loses time value premium more rapidly than a longer-term option does. The straddle calendar spread should be treated in the same manner. It is generally best to close it out at near-term expiration. If the stock is near the striking price at that time, a profit will generally result. To verify this, refer again to the prices in the preceding paragraph, with XYZ at 43 at January expiration. The January 40 straddle can be bought back for 3 points and the April 40 straddle can be sold for 6. Thus, the differential between the two straddles has widened to 3 points. Since the original differential was 2 points, this represents a profit to the strategist.

The maximum profit would be realized if XYZ were exactly at the striking price at near-term expiration. In this case, the January 40 straddle could be bought back for a very small fraction and the April 40 straddle might be worth about 5 points. The differential would have widened from the original 2 points to nearly 5 points in this case.

This strategy is inferior to the one described in the previous section (the "calendar combination"). In order to have a chance for unlimited profits, the investor must increase his net debit by the cost of buying back the near-term straddle. Consequently, this strategy should be used only in cases when the near-term straddle appears to be extremely overpriced. Furthermore, the position should be closed at near-term expiration unless the stock is so close to the striking price at that time that the near-term straddle can be bought back for a fractional price. This fractional buyback would then give the strategist the opportunity to make large potential profits with only a small increase in his risk. This situation of being able to buy back the near-term straddle at a fractional price will occur very infrequently, much more infre-

quently than the case in which both the out-of-the-money put and call expire worthless in the previous strategy. Thus, the "calendar combination" strategy will afford the spreader more opportunities for large profits, and will also never force him to increase his risk.

OWNING A "FREE" COMBINATION (THE "DIAGONAL BUTTERFLY SPREAD")

The strategies described in the previous sections are established for debits. This means that even if the near-term options expire worthless, the strategist still has risk. The long options he then holds could proceed to expire worthless as well, thereby leaving him with an overall loss equal to his original debit. There is another strategy involving both put and call options that gives the strategist the opportunity to own a "free" combination. That is, the profits from the near-term options could equal or exceed the entire cost of his long-term options.

This strategy consists of selling a near-term straddle and simultaneously purchasing both a longer-term, out-of-the-money call and a longer-term, out-of-the-money put. This differs from the protected straddle write previously described in that the long options have a more distant maturity than do the short options.

Example:

XYZ common: 40	
April 35 put:	1½
January 40 straddle:	7
April 45 call:	2½

If one were to sell the short-term January 40 straddle for 7 points and simultaneously purchase the out-of-the-money put and call combination – April 35 put and April 45 call – *he would establish a credit spread.* The credit for the position is 3 points less commissions, since 7 points are brought in from the straddle sale and 4 points are paid for the out-of-the-money combination. Note that the position technically consists of a bearish spread in the calls – buy the higher strike and sell the lower strike – coupled with a bullish spread in the puts – buy the lower strike and sell the higher strike. The investment required is in the form of collateral since both spreads are credit spreads, and is equal to the differential in the striking prices, less the net credit received. In this example, then, the investment would be 10 points for the striking price differential (5 points for the calls and 5 points for the puts) less the 3-point credit received, for a total collateral requirement of $700, plus commissions.

The potential results from this position may vary widely. However, *the risk is limited before near-term expiration.* If the underlying stock should advance substantially before January expiration, the puts would be nearly worthless and the calls would both be trading near parity. With the calls at parity, the strategist would have to pay, at most, 5 points to close the call spread, since the striking prices of the calls are 5 points apart. In a similar manner, if the underlying stock had declined substantially before the near-term January options expired, the calls would be nearly worthless and the puts would be at parity. Again, it would cost a maximum of 5 points to close the put spread, since the difference in the striking prices of the puts is also 5 points. The worst result would be a 2-point loss in this example – 3 points of credit were initially received, and the most that the strategist would have to pay to close the position is 5 points. This is the theoretical risk. In actual practice, it is very unlikely that the calls would trade as much as 5 points apart, even if the underlying stock advanced by a large amount, because the longer-term call should retain some small time value premium even if it is deeply in-the-money. A similar analysis might apply to the puts. The risk can always be quickly computed as being equal to the difference between two contiguous striking prices (two strikes next to each other), less the net credit received.

The strategist's objective with this position is to be able to buy back the near-term straddle for a price less than the original credit received. If he can do this, he will own the longer-term combination for free.

Example: Near January expiration, the strategist is able to repurchase the January 40 straddle for 2 points. Since he initially received a 3-point credit and is then able to buy back the written straddle for 2 points, he is left with an overall credit in the position of 1 point, less commissions. Once he has done this, the strategist retains the long options, the April 35 put and April 45 call. *If the underlying stock should then advance substantially or decline substantially, he could make very large profits.* However, even if the long combination expires worthless, the strategist still makes a profit, since he was able to buy the straddle back for less than the amount of the original credit.

In this example, the strategist's objective is to buy back the January 40 straddle for less than 3 points, since that is the amount of the initial credit. At expiration, this would mean that the stock would have to be between 37 and 43 for the buy-back to be made for 3 points or less. Although it is possible, certainly, that the stock will be in this fairly narrow range at near-term expiration, it is not probable. However, the strategist who is willing to add to his risk slightly can often achieve the same result by "legging out" of the January 40 straddle. It has repeatedly been stated that one should

not attempt to leg out of a spread, but this is an exception to that rule, since one owns a long combination and therefore is protected; he is not subjecting himself to large risks by attempting to "leg out" of the straddle he has written.

Example: XYZ rallies before January expiration and the January 40 put drops to a price of ½ during the rally. Even though there is time remaining until expiration, the strategist might decide to buy back the put at ½. This could potentially increase his overall risk by ½ point if the stock continues to rise. However, if the stock then reversed itself and fell, he could attempt to buy the call back at 2½ points or less. In this manner, he would still achieve his objective of buying the short-term straddle back for 3 points or less. In fact, he might be able to close both sides of the straddle well before near-term expiration if the underlying stock first moves quickly in one direction and then reverses direction by a large amount.

The maximum risk and the optimum potential objectives have been described, but interim results might also be considered in this strategy.

Example: XYZ is at 44 at January expiration. The January 40 straddle must be bought back for 4 points. This means that the long combination will not be owned free, but will have a cost of 1 point plus commissions. The strategist must decide at this time if he wants to hold on to the April options or if he wants to sell them, possibly producing a small overall profit on the entire position. There is no ironclad rule in this type of situation. If the decision is made to hold on to the longer-term options, the strategist realizes that he has assumed additional risk by doing so. Nevertheless, he may decide that it is worth owning the long combination at a relatively low cost. The cost in this example would be 1 point plus commissions, since he paid 4 points to buy back the straddle after only taking in a 3-point credit initially. The more expensive the buy-back of the near-term straddle is, the more the strategist should be readily willing to sell his long options at the same time. For example, if XYZ were at 48 at January expiration and the January 40 straddle had to be bought back for 8 points, there should be no question that he should simultaneously sell his April options as well. The most difficult decisions come when the stock is just outside the optimum buy-back area at near-term expiration. In this example, the strategist would have a fairly difficult decision if XYZ were in the 44 to 45 area or in the 35 to 36 area at January expiration.

The reader may recall that, in Chapter 14 on diagonalizing a spread, it was mentioned that one is sometimes able to own a call free by entering into a diagonal credit spread. A diagonal bear spread was given as an example. The same thing happens to be true of a diagonal bullish put spread, since that is a credit spread as well. The

strategy discussed in this section is merely a combination of a diagonal bearish call spread and a diagonal bullish put spread *and is known as a "diagonal butterfly spread."* The same concept that was described in Chapter 14 – being able to make more on the short-term call than one originally paid for the long-term call – applies here as well. *One enters into a credit position with the hope of being able to buy back the near-term written options for a profit greater than the cost of the long options.* If he is able to do this, he will own options for free and could make large profits if the underlying stock moves substantially in either direction. Even if the stock does not move after the buy-back, he still has no risk. *The risk occurs prior to the expiration of the near-term options, but this risk is limited.* As a result, this is an attractive strategy that, when operated over a period of market cycles, should produce some large profits. Ideally, these profits would offset any small losses that had to be taken. Since large commission costs are involved in this strategy, the strategist is reminded that establishing the spreads in quantity can help to reduce the percentage effect of the commissions.

SELECTING THE SPREADS

Now that the concepts of these three strategies have been laid out, let us define selection criteria for them. The "calendar combination" is the easiest of these strategies to spot. One would like to have the stock nearly halfway between two striking prices. The most attractive positions can normally be found when the striking prices are at least 10 points apart and the underlying stock is relatively volatile. The optimum time to establish the "calendar combination" is two or three months before the near-term options expire. Additionally, one would like the sum of the prices of the near-term options to be equal to at least one-half of the cost of the longer-term options. In the example given in the previous section on the "calendar combination," the near-term combination was sold for 5 points, and the longer-term combination was bought for 8 points. Thus, the near-term combination was worth more than one-half of the cost of the longer-term combination. These five criteria can be summarized as follows:

1. Relatively volatile stock.
2. Stock price nearly midway between two strikes.
3. Striking prices at least 10 points apart.
4. Two or three months remaining until near-term expiration.
5. Price of near-term combination greater than one-half the price of the longer-term combination.

Even though five criteria have been stated, it is relatively easy to find a position that satisfies all five conditions. The strategist may also be able to rely upon technical input. If the stock seems to be in a near-term trading range, the position may be more attractive, for that would indicate that the chances of the near-term combination expiring worthless are enhanced.

The "calendar straddle" is a strategy that looks deceptively attractive. As the reader should know by now, options do not decay in a linear fashion. Instead, options tend to hold time value premium until they get quite close to expiration, when the time value premium disappears at a fast rate. Consequently, the sale of a near-term straddle and the simultaneous purchase of a longer-term straddle often appear to be attractive because the debit seems small. Again, certain criteria can be set forth that will aid in selecting a reasonably attractive position. The stock should be at or very near the striking price when the position is established. Since this is basically a neutral strategy, one that offers the largest potential profits at near-term expiration, one should want to sell the most time premium possible. This is why the stock must be near the striking price initially. The underlying stock does not have to be a volatile one, although volatile stocks will most easily satisfy the next two criteria. The near-term credit should be at least two-thirds of the longer-term debit. In the example used to explain this strategy, the near-term straddle was sold for 5, while the longer-term straddle was bought for 7 points. Thus, the near-term straddle was worth more than two-thirds of the longer-term straddle's price. Finally, the position should be established with two to four months remaining until near-term expiration. If positions with a longer time remaining are used, there is a significant probability that the underlying stock will have moved some distance away from the striking price by the time the near-term options expire. Summarizing, the three criteria for a "calendar straddle" are:

1. Stock near striking price initially.
2. Two to four months remaining until near-term expiration.
3. Near-term straddle price at least two-thirds of longer-term straddle price.

The "diagonal butterfly" is the most difficult of these three types of positions to locate. Again, one would like the stock to be near the middle striking price when the position is established. Also, one would like the underlying stock to be somewhat volatile, since there is the possibility that long-term options will be owned for free. If this comes to pass, the strategist wants the stock to be capable of a large move in order to have a chance of generating large profits. The most restrictive criterion – one that will eliminate all but a few possibilities on a daily basis – is that the near-term straddle price should be at least one and one-half times that of the longer-term,

out-of-the-money combination. By adhering to this criterion, one gives himself a reasonable chance of being able to buy the near-term straddle back for a price low enough to result in owning the longer-term options for free. In the example used to describe this strategy, the near-term straddle was sold for 7 while the out-of-the-money, longer-term combination cost 4 points. This satisfies the criterion. Finally, one should limit his possible risk before near-term expiration. Recall that the risk is equal to the difference between any two contiguous striking prices, less the net credit received. In the example, the risk would be 5 minus 3, or 2 points. The risk should always be less than the credit taken in. This precludes selling a near-term straddle at 80 for 4 points and buying the put at 60 and the call at 100 for a combined cost of 1 point. Although the credit is substantially more than one and one-half times the cost of the long combination, the risk would be ridiculously high. The risk, in fact, is 20 points (the difference between two contiguous striking prices) less the 3 points credit, or 17 points – much too high.

The criteria can be summarized as follows:

1. Stock near middle striking price initially.
2. Three to four months to near-term expiration.
3. Price of written straddle at least one and one-half times that of the cost of the longer-term, out-of-the-money combination.
4. Risk before near-term expiration less than the net credit received.

One way in which the strategist may notice this type of position is when he sees a relatively short-term straddle selling at what seems to be an outrageously high price. Professionals, who often have a good feel for a stock's short-term potential, will sometimes bid up straddles when the stock is about to make a volatile move. This will cause the near-term straddles to be very overpriced. When a straddle seller notices that a particular straddle looks too attractive as a sale, he should consider establishing a diagonal butterfly spread instead. He still sells the overpriced straddle, but also buys a longer-term, out-of-the-money combination as a hedge against a large loss. Both factions can be right. Perhaps the stock will experience a very short-term volatile movement, proving that the professionals were correct. However, this will not worry the strategist holding a diagonal butterfly, for he has limited risk. Once the short-term move is over, the stock may drift back toward the original strike, allowing the near-term straddle to be bought back at a low price – the eventual objective of the strategist utilizing the diagonal butterfly spread.

These are admittedly three quite complex strategies and thus are not to be attempted by a novice investor. If one wants to gain experience in how he would operate such a strategy, it would be far better to operate a "paper strategy" for a

while. That is, one would not actually make investments, but would instead follow prices in the newspaper and make day-to-day decisions without actual risk. This will allow the inexperienced strategist to gain a feel for how these complex strategies perform over a particular time period. The astute investor can, of course, obtain price history information and track a number of market cycles in this same way.

SUMMARY

Puts and call can be combined to make some very attractive positions. The addition of a call or put credit spread to the outright purchase of a put or call can enhance the overall profitability of the position, especially if the options are expensive. In addition, three advanced strategies were presented that combined puts and calls at various expiration dates. These three various types of strategies that involve calendar combinations of puts and calls may all be attractive. One should be especially alert for these types of positions when near-term calls are overpriced. Typically, this would be during, or just after, a bullish period in the stock market. For nomenclature purposes, these three strategies are called the "calendar combination," the "calendar straddle," and the "diagonal butterfly."

All three strategies offer the possibility of large potential profits if the underlying stock remains relatively stable until the near-term options expire. In addition, all three strategies have limited risk, even if the underlying stock should move explosively in either direction prior to near-term expiration. If an intermediate result occurs – for example, the stock moves a moderate distance in either direction before near-term expiration – it is still possible to realize a limited profit in any of the strategies, because of the fact that the time premiums decay much more rapidly in the near-term options than they do in the longer-term options.

The three strategies have many things in common, but each has its own advantages and disadvantages. The "diagonal butterfly" is the only one of the three strategies whereby the strategist has a possibility of owning free options. Admittedly, the probability of actually being able to own the options completely for free is small. However, there is a relatively large probability that one can substantially reduce the cost of the long options. The "calendar combination," the first of the three strategies discussed, offers the largest probability of capturing the entire near-term premium. This is because both near-term options are out-of-the-money to begin with. The "calendar straddle" offers the largest potential profits at near-term expiration. That is, if the stock is relatively unchanged from the time the position was established until the time the near-term options expire, the "calendar straddle" will show the best profit of the three strategies at that time.

Looking at the negative side, the "calendar straddle" is the least attractive of the three strategies, primarily because one is forced to increase his risk after near-term expiration, if he wants to continue to hold the longer-term options. It is often difficult to find a "diagonal butterfly" that offers enough credit to make the position attractive. Finally, the "calendar combination" has the largest probability of losing the entire debit eventually, because one may find that the longer-term options expire worthless also. (They are out-of-the-money to begin with, just as the near-term options were.)

The strategist will not normally be able to find a large number of these positions available at attractive price levels at any particular time in the market. However, since they are attractive strategies with little or no margin collateral requirements, the strategist should constantly be looking for these types of positions. A certain amount of cash or collateral should be reserved for the specific purpose of utilizing it for these types of positions – perhaps 15 to 20% of one's dollars.

CHAPTER 24

Ratio Spreads Using Puts

The put option spreader may want to sell more puts than he owns. This creates a ratio spread. Basically, two types of put ratio spreads may prove to be attractive: the standard ratio put spread and the ratio calendar spread using puts. Both strategies are designed for the more aggressive investor; when operated properly, both can present attractive reward opportunities.

THE RATIO PUT SPREAD

This strategy is designed for a neutral to slightly bearish outlook on the underlying stock. In a ratio put spread, one buys a number of puts at a higher strike and sells more puts at a lower strike. This position involves naked puts, since one is short more puts than he is long. *There is limited upside risk in the position,* but the downside risk can be very large. The maximum profit can be obtained if the stock is exactly at the striking price of the written puts at expiration.

Example: Given the following:

XYZ common, 50;

XYZ January 45 put, 2; and

XYZ January 50 put, 4.

A ratio put spread might be established by buying one January 50 put and simultaneously selling two January 45 puts. Since one would be paying $400 for the purchased put and would be collecting $400 from the sale of the two out-of-the-money puts, the spread could be done for even money. There is no upside risk in this position. If XYZ should rally and be above 50 at January expiration, all the puts would

expire worthless and the result would be a loss of commissions. However, there is downside risk. If XYZ should fall by a great deal, one would have to pay much more to buy back the two short puts than he would receive from selling out the one long put. The maximum profit would be realized if XYZ were at 45 at expiration, since the short puts would expire worthless, but the long January 50 put would be worth 5 points and could be sold at that price. Table 24-1 and Figure 24-1 summarize the position. Note that there is a range within which the position is profitable – 40 to 50 in this example. If XYZ is above 40 and below 50 at January expiration, there will be some profit, before commissions, from the spread. Below 40 at expiration, losses will be generated and, although these losses are limited by the fact that a stock cannot decline in price below zero, these losses could become very large. There is no upside risk, however, as was pointed out earlier. The following formulae summarize the situation for any put ratio spread:

Maximum upside risk = Net debit of spread (no upside risk if done for a credit)

Maximum profit potential = Striking price differential × Number of long puts – Net debit (or plus net credit)

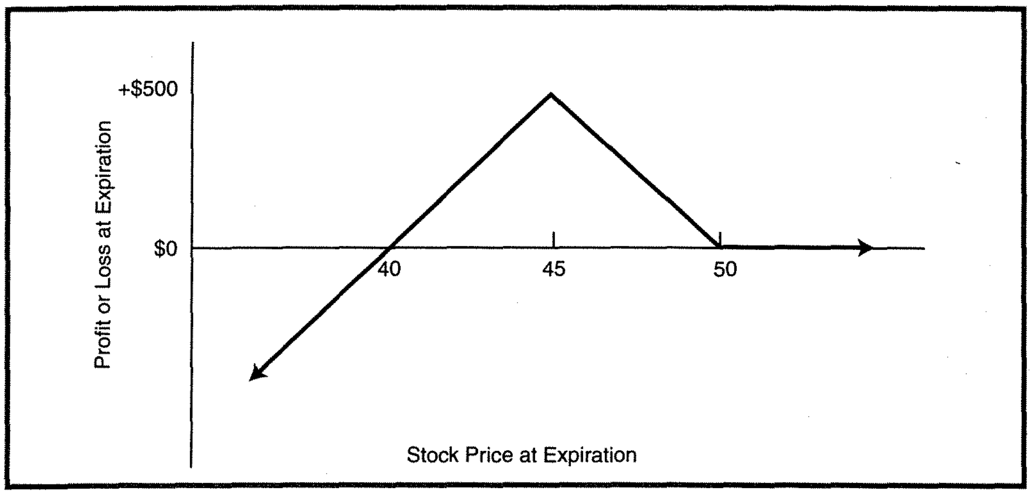
Downside break-even price = Lower strike price – Maximum profit potential ÷ Number of naked puts

The investment required for the put ratio spread consists of the collateral requirement necessary for a naked put, plus or minus the credit or debit of the entire position. Since the collateral requirement for a naked option is 20% of the stock

TABLE 24-1.
Ratio put spread.

XYZ Price at Expiration	Long January 50 Put Profit	Short 2 January 45 Put Profit	Total Profit
20	+$2,600	–$4,600	–$2,000
30	+ 1,600	– 2,600	– 1,000
40	+ 600	– 600	0
42	+ 400	– 200	+ 200
45	+ 100	+ 400	+ 500
48	– 200	+ 400	+ 200
50	– 400	+ 400	0
60	– 400	+ 400	0

FIGURE 24-1.
Ratio put spread.



price, plus the premium, minus the amount by which the option is out-of-the-money, the actual dollar requirement in this example would be $700 (20% of $5,000, plus the $200 premium, minus the $500 by which the January 45 put is out-of-the-money). As with all types of naked writing positions, the strategist should allow enough collateral for an adverse stock move to occur. This will allow enough room for stock movement without forcing early liquidation of the position due to a margin call. If, in this example, the strategist felt that he might stay with the position until the stock declined to 39, he should allow $1,380 in collateral (20% of $3,900 plus the $600 in-the-money amount).

The ratio put spread is generally most attractive when the underlying stock is initially between the two striking prices. That is, if XYZ were somewhere between 45 and 50, one might find the ratio put spread used in the example attractive. If the stock is initially below the lower striking price, a ratio put spread is not as attractive, since the stock is already too close to the downside risk point. Alternatively, if the stock is too far above the striking price of the written calls, one would normally have to pay a large debit to establish the position. Although one could eliminate the debit by writing four or five short options to each put bought, large ratios have extraordinarily large downside risk and are therefore very aggressive.

Follow-up action is rather simple in the ratio put spread. There is very little that one need do, except for closing the position if the stock breaks below the downside break-even point. Since put options tend to lose time value premium rather quickly after they become in-the-money options, there is not normally an opportunity to roll

down. Rather, one should be able to close the position with the puts close to parity if the stock breaks below the downside break-even point. The spreader may want to buy in additional long puts, as was described for call spreads in Chapter 11, but this is not as advantageous in the put spread because of the time value premium shrinkage.

This strategy may prove psychologically pleasing to the less experienced investor because he will not lose money on an upward move by the underlying stock. Many of the ratio strategies that involve call options have upside risk, and a large number of investors do not like to lose money when stocks move up. Thus, although these investors might be attracted to ratio strategies because of the possibility of collecting the profits on the sale of multiple out-of-the-money options, they may often prefer ratio put spreads to ratio call spreads because of the small upside risk in the put strategy.

USING DELTAS

The "delta spread" concept can also be used for establishing and adjusting neutral ratio put spreads. The delta spread was first described in Chapter 11. A neutral put spread can be constructed by using the deltas of the two put options involved in the spread. The neutral ratio is determined by dividing the delta of the put at the higher strike by the delta of the put at the lower strike. Referring to the previous example, suppose the delta of the January 45 put is –.30 and the delta of the January 50 put is –.50. Then a neutral ratio would be 1.67 (–.50 divided by –.30). That is, 1.67 puts would be sold for each put bought. One might thus sell 5 January 45 puts and buy 3 January 50 puts.

This type of spread would not change much in price for small fluctuations in the underlying stock price. However, as time passes, the preponderance of time value premium sold via the January 45 puts would begin to turn a profit. As the underlying stock moves up or down by more than a small distance, the neutral ratio between the two puts will change. The spreader can adjust his position back into a neutral one by selling more January 45's or buying more January 50's.

THE RATIO PUT CALENDAR SPREAD

The ratio put calendar spread consists of buying a longer-term put and selling a larger quantity of shorter-term puts, all with the same striking price. The position is generally established with out-of-the-money puts – that is, the stock is above the striking price – so that there is a greater probability that the near-term puts will expire worth-

less. Also, the position should be established for a credit, such that the money brought in from the sale of the near-term puts more than covers the cost of the longer-term put. If this is done and the near-term puts expire worthless, the strategist will then own the longer-term put free, and large profits could result if the stock subsequently experiences a sizable downward movement.

Example: If XYZ were at 55, and the January 50 put was at 1½ with the April 50 at 2, one could establish a ratio put calendar spread by buying the April 50 and selling two January 50 puts. This is a credit position, because the sale of the two January 50 puts would bring in \$300 while the cost of the April 50 put is only \$200. If the stock remains above 50 until January expiration, the January 50 puts will expire worthless and the April 50 put will be owned for free. In fact, even if the April 50 put should then expire worthless, the strategist will make a small profit on the overall position in the amount of his original credit – \$100 – less commissions. However, after the Januarys have expired worthless, if XYZ should drop dramatically to 25 or 20, a very large profit would accrue on the April 50 put that is still owned.

The risk in the position could be very large if the stock should drop well below 50 before the January puts expire. For example, if XYZ fell to 30 prior to January expiration, one would have to pay \$4,000 to buy back the January 50 puts and would receive only \$2,000 from selling out his long April 50 put. This would represent a rather large loss. Of course, this type of tragedy can be avoided by taking appropriate follow-up action. *Normally, one would close the position if the stock fell more than 8 to 10% below the striking price before the near-term puts expire.*

As with any type of ratio position, naked options are involved. This increases the collateral requirement for the position and also means that the strategist should allow enough collateral in order for the follow-up action point to be reached. In this example, the initial requirement would be \$750 (20% of \$5,500, plus the \$150 January premium, less the \$500 by which the naked January 50 put is out-of-the-money). However, if the strategist decides that he will hold the position until XYZ falls to 46, he should allow \$1,320 in collateral (20% of \$4,600 plus the \$400 in-the-money amount). Of course, the \$100 credit, less commissions, generated by the initial position can be applied against these collateral requirements.

This strategy is a sensible one for the investor who is willing to accept the risk of writing a naked put. Since the position should be established with the stock above the striking price of the put options, there is a reasonable chance that the near-term puts will expire worthless. This means that some profit will be generated, and that the profit could be large if the stock should then experience a large downward move before the longer-term puts expire. One should take care, however, to limit his losses

before near-term expiration, since the eventual large profits will be able to overcome a series of small losses, but could not overcome a preponderance of large losses.

RATIO PUT CALENDARS

Using the deltas of the puts in the spread, the strategist can construct a neutral position. If the puts are initially out-of-the-money, then the neutral spread generally involves selling more puts than one buys. Another type of ratioed put calendar can be constructed with in-the-money puts. As with the companion in-the-money spread with calls, one would buy more puts than he sells in order to create a neutral ratio.

In either case, the delta of the put to be purchased is divided by the delta of the put to be sold. The result is the neutral ratio, which is used to determine how many puts to sell for each one purchased.

Example: Consider the out-of-the-money case. XYZ is trading at 59. The January 50 put has a delta of 0.10 and the April 50 put has a delta of –0.17. If a calendar spread is to be established, one would be buying the April 50 and selling the January 50. Thus, the neutral ratio would be calculated as 1.7 to 1 (–0.17/–0.10). Seventeen puts would be sold for every 10 purchased.

This spread has naked puts and therefore has large risk if the underlying stock declines too far. However, follow-up action could be taken if the stock dropped in an orderly manner. Such action would be designed to limit the downside risk.

Conversely, the calendar spread using in-the-money puts would normally have one buying more options than he is selling. An example using deltas will demonstrate this fact:

Example: XYZ is at 59. The January 60 put has a delta of –0.45 and the April 60 put has a delta of –0.40. It is normal for shorter-term, in-the-money options to have a delta that is larger (in absolute terms) than longer-term, in-the-money options.

The neutral ratio for this spread would be 0.889 (–0.40/–0.45). That is, one would sell only 0.889 puts for each one he bought. Alternatively stated, he would sell 8 and buy 9.

A spread of this type has no naked puts and therefore does have large downside profit potential. If the stock should rise too far, the loss is limited to the initial debit of the spread. The optimum result would occur if the stock were at the strike at expiration because, even though the excess long put would lose money in that case, the spreads involving the other puts would overcome that small loss.

Another risk of the in-the-money put spread is that one might be assigned rather quickly if the stock should drop. In fact, one must be careful not to establish

the spread with puts that are too deeply in-the-money, for this reason. While being put will not necessarily change the profitability of the spread, it will mean increased commission costs and margin charges for the customer, who must buy the stock upon assignment.

A LOGICAL EXTENSION (THE RATIO CALENDAR COMBINATION)

The previous section demonstrated that ratio put calendar spreads can be attractive. The ratio call calendar spread was described earlier as a reasonably attractive strategy for the bullish investor. A logical combination of these two types of ratio calendar spreads (put and call) would be the *ratio combination* – buying a longer-term out-of-the-money combination and selling several near-term out-of-the-money combinations.

Example: The following prices exist:

XYZ common: 55			
XYZ January 50 put:	$1\frac{1}{2}$	XYZ April 50 put:	2
XYZ January 60 call:	$3\frac{1}{2}$	XYZ April 60 call:	5

One could sell the near-term January combination (January 50 put and January 60 call) for 5 points. It would cost 7 points to buy the longer-term April combination (April 50 put and April 60 call). By selling more January combinations than April combinations bought, a ratio calendar combination could be established. For example, suppose that a strategist sold two of the near-term January combinations, bringing in 10 points, and simultaneously bought one April combination for 7 points. This would be a credit position, a credit of 3 points in this example. If the near-term, out-of-the-money combination expires worthless, a guaranteed profit of 3 points will exist, even if the longer-term options proceed to expire totally worthless. *If the near-term combination expires worthless, the longer-term combination is owned for free, and a large profit could result on a substantial stock price movement in either direction.*

Although this is a superbly attractive strategy if the near-term options do, in fact, expire worthless, it must also be monitored closely so that large losses do not occur. These large losses would be possible if the stock broke out in either direction too quickly, before the near-term options expire. In the absence of a technical opinion on the underlying stock, one can generally compute a stock price at which it might be reasonable to take follow-up action. This is a similar analysis to the one

described for ratio call calendar spreads in Chapter 12. Suppose the stock in this example began to rally. There would be a point at which the strategist would have to pay 3 points of debit to close the call side of the combination. That would be his break-even point.

Example: With XYZ at 65 at January expiration (5 points above the higher strike of the original combination), the near-term January 60 call would be worth 5 points and the longer-term April 60 call might be worth 7 points. If one closed the call side of the combination, he would have to pay 10 points to buy back two January 60 calls, and would receive 7 points from selling out his April 60. This closing transaction would be a 3-point debit. This represents a break-even situation up to this point in time, except for commissions, since a 3-point credit was initially taken in. The strategist would continue to hold the April 50 put (the January 50 put would expire worthless) just in case the improbable occurs and the underlying stock plunges below 50 before April expiration. A similar analysis could be performed for the put side of the spread in case of an early downside breakout by the underlying stock. It might be determined that the downside break-even point at January expiration is 46, for example. Thus, the strategist has two parameters to work with in attempting to limit losses in case the stock moves by a great deal before near-term expiration: 65 on the upside and 46 on the downside. In practice, if the stock should reach these levels *before,* rather than *at,* January expiration, the strategist would incur a small loss by closing the in-the-money side of the combination. This action should still be taken, however, *as the objective of risk management of this strategy is to take small losses, if necessary.* Eventually, large profits may be generated that could more than compensate for any small losses that were incurred.

The foregoing follow-up action was designed to handle a volatile move by the underlying stock prior to near-term expiration. Another, perhaps more common, time when follow-up action is necessary is when the underlying stock is relatively unchanged at near-term expiration. If XYZ in the example above were near 55 at January expiration, a relatively large profit would exist at that time: The near-term combination would expire worthless for a gain of 10 points on that sale, and the longer-term combination would probably still be worth about 5 points, so that the unrealized loss on the April combination would be only 2 points. This represents a total (realized and unrealized) gain of 8 points. In fact, *as long as the near-term combination can be bought back for less than the original 3-point credit of the position, the position will show a total unrealized gain at near-term expiration.* Should the gain be taken, or should the longer-term combination be held in hopes of a volatile move by the underlying stock? Although the strategist will normally handle each position

on a case-by-case basis, the general philosophy should be to hold on to the April combination. A profit is already guaranteed at this time – the worst that can happen is a 3-point profit (the original credit). Consequently, the strategist should allow himself the opportunity to make large profits. The strategist may want to attempt to trade out of his long combination, since he will not risk making the position a losing one by doing so. Technical analysis may be able to provide him with buy or sell zones on the stock, and he would then consider selling out his long options in accordance with these technical levels.

In summary, *this strategy is very attractive and should be utilized by strategists who have the expertise to trade in positions with naked options.* As long as risk management principles of taking small losses are adhered to, there will be a large probability of overall profit from this strategy.

PUT OPTION SUMMARY

This concludes the section on put option strategies. The put option is useful in a variety of situations. First, it represents a more attractive way to take advantage of a bearish attitude with options. Second, the use of the put options opens up a new set of strategies – straddles and combinations – that can present reasonably high levels of profit potential. Many of the strategies that were described in Part II for call options have been discussed again in this part. Some of these strategies were described more fully in terms of philosophy, selection procedures, and follow-up action when they were first discussed. The second description – the one involving put options – was often shortened to a more mechanical description of how puts fit into the strategy. This format is intentional. The reader who is planning to employ a certain strategy that can be established with either puts or calls (a bear spread, for example) should familiarize himself with both applications by a simultaneous review of the call chapter and its analogous put chapter.

The combination strategies generally introduced new concepts to the reader. The combination allows the construction of positions that are attractive with either puts or calls (out-of-the-money calendar spreads, for example) to be combined into one position. The four combination strategies that involve selling short-term options and simultaneously buying longer-term options are complex, but are most attractive in that they have the desirable features of limited risk and large potential profits.

CHAPTER 25

LEAPS

In an attempt to provide customers with a broader range of derivative products, the options exchanges introduced LEAPS. This chapter does a fair amount of reviewing basic option facts in order to explain the concepts behind LEAPS. The reader who has a knowledge of the preceding chapters and therefore does not need the review will be able to quickly skim through this chapter and pick out the strategically important points. However, if one encounters concepts here that don't seem familiar, he should review the earlier chapter that discusses the pertinent strategy.

The term LEAPS is a name for "long-term option." A LEAPS is nothing more than a listed call or put option that is issued with two or more years of time remaining. It is a longer-term option than we are used to dealing with. Other than that, there is no material difference between LEAPS and the other calls and puts that have been discussed in the previous chapters.

LEAPS options were first introduced by the CBOE in October 1990, and were offered on a handful of blue-chip stocks. Their attractiveness spurred listings on many underlying stocks on all option exchanges as well as on several indices. (Index options are covered in a later section of the book.)

Strategies involving long-term options are not substantially different from those involving shorter-term options. However, the fact that the option has so much time remaining seems to favor the buyer and be a detriment to the seller. This is one reason why LEAPS have been popular. As a strategist, one knows that the length of time remaining has little to do with whether a certain strategy makes sense or not. Rather, it is the relative value of the option that dictates strategy. If an option is overpriced, it is a viable candidate for selling, whether it has two years of life remaining or two months. Obviously, follow-up action may become much more of a necessity during the life of a two-year option; that matter is discussed later in this chapter.

THE BASICS

Certain facets of LEAPS are the same as for other listed equity options, while others involve slight differences. The amount of standardization is considerably less, which makes the simple process of quoting LEAPS a bit more tedious. LEAPS are listed options that can be traded in a secondary market or can be exercised before expiration. As with other listed equity options, they do not receive the dividend paid by the underlying common stock.

Recall that four specifications uniquely describe any option contract:

1. the type (put or call),
2. the underlying stock name (and symbol),
3. the expiration date, and
4. the striking price.

Type. LEAPS are puts or calls. The LEAPS owner has the right to buy the stock at the striking price (LEAPS call) or sell it there (LEAPS put). This is exactly the same for LEAPS and for regular equity options.

Underlying Stock and Quote Symbol. The underlying stocks are the same for LEAPS as they are for equity options. The base symbol in an option quote is the part that designates the underlying stock. For equity options, the base symbol is the same as the stock symbol. However, until the Option Price Reporting Authority (OPRA) changes the way that all options are quoted, the base symbols for LEAPS are not the same as the stock symbols. For example, LEAPS options on stock XYZ might trade under the base symbol WXY; so it is possible that one stock might have listed options trading with different base symbols even though all the symbols refer to the same underlying stock. Check with your broker to determine the LEAPS symbol if you need to know it.

Expiration Date. LEAPS expire on the Saturday following the third Friday of the expiration month, just as equity options do. One must look in the newspaper, ask his broker, or check the Internet (www.cboe.com) to determine what the expiration months are, however, since they are also not completely standardized. When LEAPS were first listed, there were differing expiration months through December 1993. At the current time, LEAPS are issued to expire in January of each year, so some attempt is being made at standardization. However, there is no guarantee that varying expiration months won't reappear at some future time.

Striking Price. There is no standardized striking price interval for LEAPS as there is for equity options. If XYZ is a 95-dollar stock, there might be LEAPS with striking prices of 80, 95, and 105. Again, one must look in the newspaper, ask his broker, or check the Internet (www.cboe.com) to determine the actual LEAPS striking prices for any specific underlying stock. New striking prices can be introduced when the underlying stock rises or falls too far. For example, if the lowest strike for XYZ were 80 and the stock fell to 80, a new LEAPS strike of 70 might be introduced.

Other Basic Factors. LEAPS may be exercised at any time during their life, just as is the case with equity options. Note that this statement regarding exercise is not necessarily true for Index LEAPS or Index Options. See Part V of this book for discussions of index products.

Standard LEAPS contracts are for 100 shares of the underlying stock, just as equity options are. The number of shares would be adjusted for stock splits and stock dividends (leading to even more arcane LEAPS symbol problems). LEAPS are quoted on a per-share basis, as are other listed options.

There are position and exercise limits for LEAPS just as there are for other listed options. One must add his LEAPS position and his regular equity option position together in order to determine his entire position quantity. Exemptions may be obtained for bona fide hedgers of common stock.

As time passes, LEAPS eventually have less than 9 months remaining until expiration. When such a time is reached, the LEAPS are "renamed" and become ordinary equity options on the underlying security.

Example: Assume LEAPS on stock XYZ were initially issued to expire two years hence. Assume that one of these LEAPS is the XYZ January 90; that is, it has a striking price of 90 and expires in January, two years from now. Its symbol is WXYAR (WXY being the LEAPS base symbol assigned by the exchange where XYZ is traded, A for January, and R for 90).

Fifteen months later, the January LEAPS only have 9 months of life remaining. The LEAPS symbol would be changed from WXYAR to XYZAR (a regular equity option), and the quotes would be listed in the regular equity option section of the newspaper instead of in the LEAPS section.

PRICING LEAPS

Terms such as in-the-money, out-of-the-money, intrinsic value, time value premium, and parity all apply and have the same definitions. The factors influencing the prices of LEAPS are the same as those for any other option:

1. underlying stock price,
2. striking price,
3. time remaining,
4. volatility,
5. risk-free interest rate, and
6. dividend rate.

The relative influence of these factors may be a little more pronounced for LEAPS than it is for shorter-term equity options. Consequently, the trader may think that a LEAPS is overly expensive or cheap by inspection, when in reality it is not. *One should be careful in his evaluation of LEAPS until he has acquired experience in observing how their prices relate to the shorter-term equity options with which he is experienced.*

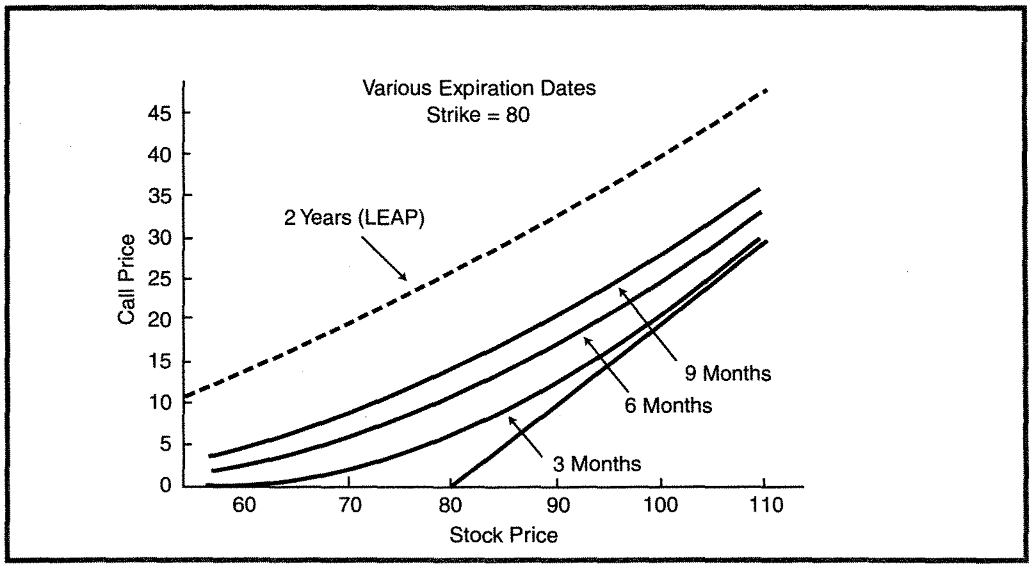
It might prove useful to reexamine the option pricing curve with some LEAPS included. Please refer to Figure 25-1 for the pricing curves of several options. As always, the solid intrinsic value line is the bottom line; it is the same for any call option. The curves are all drawn with the same values for the pertinent variables: stock price, striking price, volatility, short-term interest rate, and dividends. Thus, they can be compared directly.

The most obvious thing to notice about the curves in Figure 25-1 is that the curve depicting the 2-year LEAPS is quite flat. It has the *general* shape of the shorter-term curves, but there is so much time value at stock prices even 25% in- or out-of-the-money, that the 2-year curve is much flatter than the others.

Other observations can be made as well. Notice the at-the-money options: The 2-year LEAPS sells for a little more than four times the 3-month option. As we shall see, this can change with the effects of interest rates and dividends, but it confirms something that was demonstrated earlier: Time decay is not linear. Thus, the 2-year LEAPS, which has eight times the amount of time remaining as compared to the 3-month call, only sells for about four times as much. This LEAPS might appear cheap to the casual observer, but remember that these graphs depict the fair values for this set of input parameters. *Do not be deluded into thinking that a LEAPS looks cheap merely by comparing its price to a nearer-term option; use a model to evaluate it,* or at least use the output of someone else's model.

The curves in Figure 25-1 depict the relationships between stock price, striking price, and time remaining. The most important remaining determinant of an option's price is the volatility of the underlying stock. Changes in volatility can greatly change the price of any option. This is especially true for LEAPS, since a long-term option's price will fluctuate greatly when volatility changes only a little. Some observations on the differing effects that volatility changes have on short- and long-term options are presented later.

FIGURE 25-1.
LEAPS call pricing curve.



Before that discussion, however, it may be beneficial to examine the effects that interest rates and dividends can have on LEAPS. These effects are much, much greater than those on conventional equity options. Recall that it was stated that interest rates and dividends are minor determinants in the price of an option, unless the dividends were large. That statement pertains mostly to short-term options. For longer-term options such as LEAPS, the cumulative effect of an interest rate or dividend over such a long period of time can have a magnified effect in terms of the absolute price of the option.

Figure 25-2 presents the option pricing curve again, but the only option depicted is a 2-year LEAPS. The striking price is 100, and the straight line at the right depicts the intrinsic value of the LEAPS. The three curves represent option prices for risk-free interest rates of 3%, 6%, and 9%. All other factors (time to expiration, volatility, and dividends) are fixed. The difference between option prices caused merely by a shift in rates of 3% is very large.

The difference in LEAPS prices increases as the LEAPS becomes in-the-money. Note that in this figure, the distance between the curves gets wider as one scans them from left to right. The price difference for *out-of-the-money* LEAPS is large enough – nearly a point even for options fairly far out-of-the-money (that is, the points on the left-hand side of the graph). A shift of 3% in rates causes a larger price difference of over 2 points in the *at-the-money*, 2-year LEAPS. The largest differential in option prices occurs *in-the-money*! This may seem somewhat illogical, but when LEAPS strategies are examined later, the reasons for this will become clear.

Suffice it to say that the in-the-money LEAPS are changed in price by over 4 points when rates change by 3%. That is a monstrous differential and should cause any trader who is considering trading in-the-money LEAPS to consider what his outlook is for short-term interest rates.

There is always a substantial probability that rates can change by 3% in two years. Thus, it is difficult to predict with any certainty what risk-free rate to use in the pricing of two-year LEAPS. Moreover, one should be very careful when deciding LEAPS are "cheap" or "expensive" because, conventionally, the short-term interest rate is not usually considered as a significant factor in making such an analysis. For LEAPS, however, Figure 25-2 is obvious proof that interest rate considerations are important for LEAPS traders.

Now consider dividends. Figure 25-3 depicts the prices of two-year LEAPS calls. The three curves on the graph are for different dividend rates – the top line representing the current rate, the middle line representing prices if the dividend were raised by $1 annually, and the bottom line showing what prices would be if the dividend were raised by $2 annually. All other factors (volatility, time remaining, and risk-free interest rates) are the same for each curve in this graph. The increase in dividends manifests itself by decreasing the LEAPS call price. The reason that this is true, of course, is that the stock will be reduced in price more when it goes ex-dividend by the larger amounts of the increased dividends.

FIGURE 25-2.
2-year LEAPS call pricing curve, interest rate comparison.

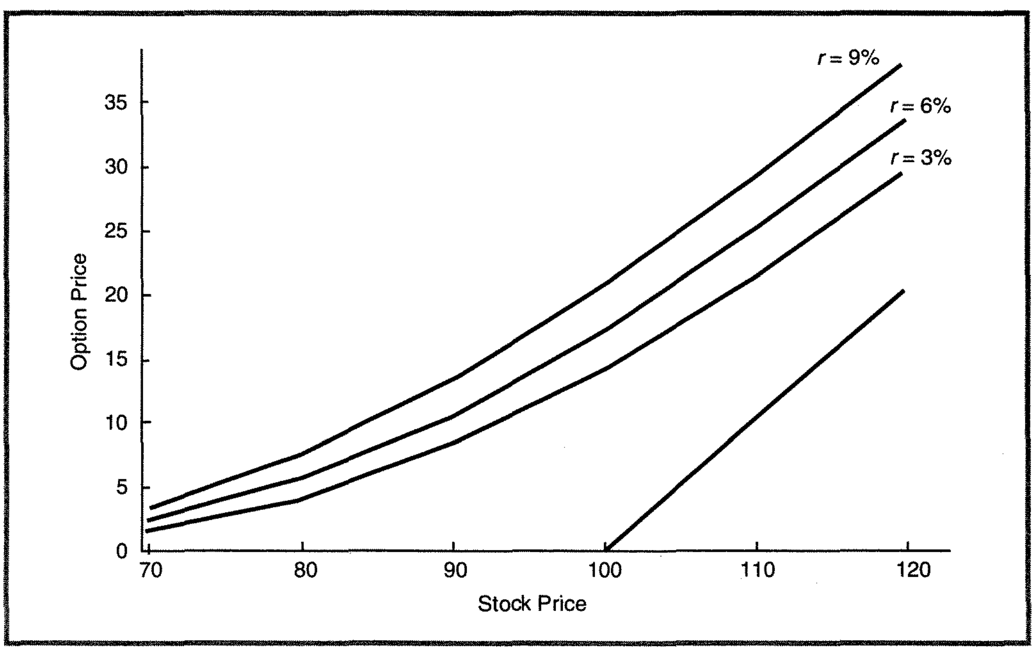
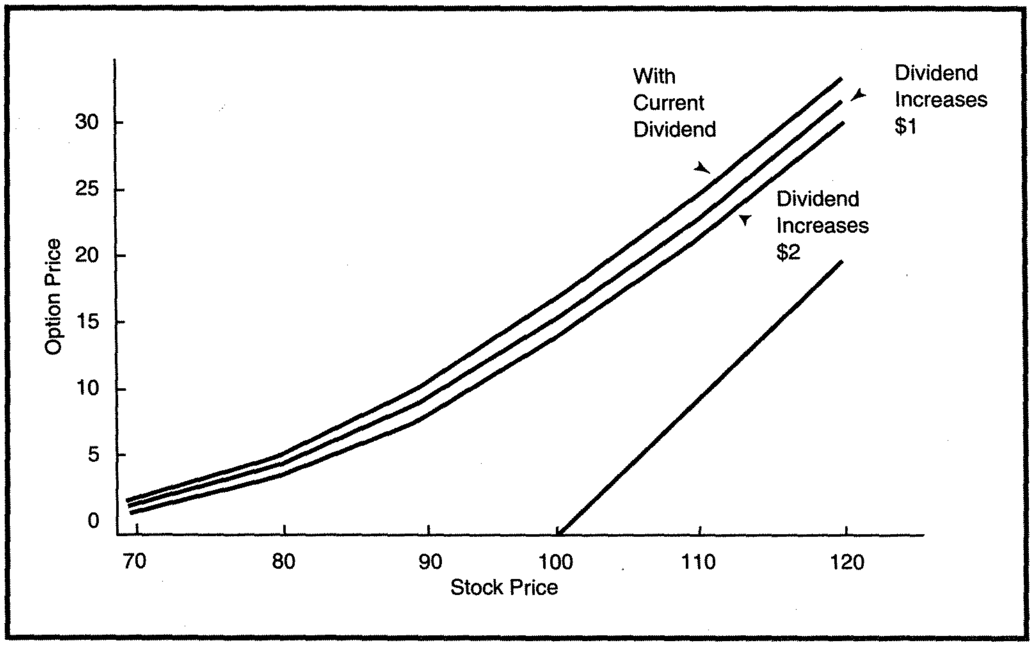


FIGURE 25-3.
LEAPS call pricing curve as dividends increase.



The actual amount that the LEAPS calls lose in price increases slightly as the call is more in-the-money. That is, the curves are closer together on the left-hand (out-of-the-money) side than they are on the right-hand (in-the-money) side. For the in-the-money call, a $1 increase in dividends over two years can cause the LEAPS to be worth about 1½ points less in value.

Figure 25-3 is to the same scale as Figure 25-2, so they can be compared directly in terms of magnitude. Notice that the effect of a $1 increase in dividends on the LEAPS call prices is much smaller than that of an increase in interest rates by 3%. Graphically speaking, one can observe this by noting that the spaces between the three curves in the previous figure are much wider than the spaces between the three curves in this figure.

Finally, note that dividend increases have the opposite effect on puts. That is, an increase in the dividend payout of the underlying common will cause a put to *increase* in price. If the put is a long-term LEAPS put, then the effect of the increase will be even larger.

Lest one think that LEAPS are too difficult to price objectively, note the following. The prior figures of interest rate and dividend effects tend to magnify the effects on LEAPS prices for two reasons. First, they depict the effects on 2-year LEAPS. That is a large amount of life for LEAPS. Many LEAPS have less life remaining, so the effects would be diminished somewhat for LEAPS with 10 to 23 months of life left.

Second, the figures depict the change in rates or dividends as being instantaneous. This is not completely realistic. If rates change, they will change by a little bit at a time, usually 1/4% or 1/2% at a time, perhaps as much as 1%. If dividends are increased, that increase may be instantaneous, but it will not likely occur immediately after the LEAPS are purchased or sold. However, the point that these figures are meant to convey is that interest rates and dividends have a much greater effect on LEAPS than on ordinary shorter-term equity options, and that is certainly a true statement.

COMPARING LEAPS AND SHORT-TERM OPTIONS

Table 25-1 will help to illustrate the problem in valuing LEAPS, either mentally or with a model. All of the variables – stock price, volatility, interest rates, and dividends – are given in increments and the comparison is shown between 3-month equity options and 2-year LEAPS. There are three sets of comparisons: for options 20% out-of-the-money, options at-the-money, and options 20% in-the-money.

A few words are needed here to explain how volatility is shown in this table. Volatility is normally expressed as a percent. The volatility of the stock market is about 15%. The table shows what would happen if volatility changed by one percentage point, to 16%, for example. Of course, the table also shows what would happen if the other factors changed by a small amount.

Most of the discrepancies between the 3-month and the 2-year options are large. For example, if volatility increases by one percentage point, the 3-month out-of-the-money call will increase in price by only 3 cents (0.03 in the left-hand column) while the 2-year LEAPS call will increase by 43 cents. As another example, look at the bottom right-hand pair of numbers, which show the effect of a dividend increase on the options that are 20% in-the-money. The assumption is that the dividend will increase 25 cents this quarter (and will be 25 cents higher every quarter thereafter). This translates into a loss of 14 cents for the 3-month call, since there is only one ex-dividend period that affects this call; but it translates into a loss of 1½ for the 2-year LEAPS, since the stock will go ex-dividend by an extra $2 over the life of that call.

TABLE 25-1.
Comparing LEAPS and Short-Term Calls.

		Change in Price of the Options					
		20% out		at		20% in	
Variable	Increment	3-mo.	2-yr.	3-mo.	2-yr.	3-mo.	2-yr.
Stock Prc.	+ 1 pt	.03	.41	.54	.70	.97	.89
Volatility	+ 1%	.03	.43	.21	.48	.04	.33
Int. Rate	+ 1/2%	.01	.27	.08	.55	.14	.72
Dividend	+ $.25/qtr	0	–.62	–.08	–1.18	–.14	–1.50

The table also shows that only three of the discrepancies are not large. Two involve the stock price change. If the stock changes in price by 1 point, neither the at-the-money nor the in-the-money options behave very differently, although the at-the-money LEAPS do jump by 70 cents. The observant reader will notice that the top line of the table depicts the *delta* of the options in question; it shows the change in option price for a one-point change in stock price. The only other comparison that is not extremely divergent is that of volatility change for the at-the-money option. The 3-month call changes by 21 cents while the LEAPS changes by nearly ½ point. This is still a factor of two-to-one, but is much less than the other comparisons in the table.

Study the other comparisons in the table. The trader who is used to dealing with short-term options might ordinarily ignore the effect of a rise in interest rates of ½ of 1%, of a 25-cent increase in the quarterly dividend, of the volatility increasing by a mere 1%, or maybe even of the stock moving by one point (only if his option is out-of-the-money). The LEAPS option trader will gain or suffer substantially and immediately if any of these occur. In almost every case, his LEAPS call will gain or lose ½ point of value – a significant amount, to be sure.

LEAPS STRATEGIES

Many of the strategies involving LEAPS are not significantly different from their counterparts that involve short-term options. However, as shown earlier, the long-term nature of the LEAPS can sometimes cause the strategist to experience a result different from that to which he has become accustomed.

As a general rule, one would want to be a buyer of LEAPS when interest rates were low and when the volatilities being implied in the marketplace are low. If the opposite were true (high rates and high volatilities), he would lean toward strategies in which the sale of LEAPS is used. Of course, there are many other specific considerations when it comes to operating a strategy, but since the long-term nature of LEAPS exposes one to interest rate and volatility movements for such a long time, one may as well attempt to position himself favorably with respect to those two elements when he enters a position.

LEAPS AS STOCK SUBSTITUTE

Any in-the-money option can be used as a substitute for the underlying stock. Stock owners may be able to substitute a long in-the-money call for their long stock. Short sellers of stock may be able to substitute a long put for their short stock. This is not a new idea; it was discussed briefly in Chapter 3 under reasons why people buy calls. It has been available as a strategy for some time with short-term options. Its attractiveness seems to have increased somewhat with the introduction of LEAPS, howev-

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er. More and more people are examining the potential of selling the stock they own and buying long-term calls (LEAPS) as a substitute, or buying LEAPS instead of making an initial purchase in a particular common stock.

Substitution for Stock Currently Held Long. Simplistically, this strategy involves this line of thinking: If one owns stock and sells it, an investor could reinvest a small portion of the proceeds in a call option, thereby providing continued upside profit potential if the stock rises in price, and invest the rest in a bank to earn interest. The interest earned would act as a substitute for the dividend, if any, to which the investor is no longer entitled. Moreover, he has less downside risk: If the stock should fall dramatically, his loss is limited to the initial cost of the call.

In actual practice, one should carefully calculate what he is getting and what he is giving up. For example, is the loss of the dividend too great to be compensated for by the investment of the excess proceeds? How much of the potential gain will be wasted in the form of time value premium paid for the call? The costs to the stock owner who decides to switch into call options as a substitute are commissions, the time value premium of the call, and the loss of dividends. The benefits are the interest that can be earned from freeing up a substantial portion of his funds, plus the fact that there is less downside risk in owning the call than in owning the stock.

Example: XYZ is selling at 50. There are one-year LEAPS with a striking price of 40 that sell for \$12. XYZ pays an annual dividend of \$0.50 and short-term interest rates are 5%. What are the economics that an owner of 100 XYZ common stock must calculate in order to determine whether it is viable to sell his stock and buy the one-year LEAPS as a substitute?

The call has time value premium of 2 points (40 + 12 – 50). Moreover, if the stock is sold and the LEAPS purchased, a credit of \$3,800 less commissions would be generated. First, calculate the net credit generated:

Credit balance generated:		
Sale of 100 XYZ stock	\$5,000	
Less stock commission	– 25	
Net sale proceeds:	\$4,975 credit	
Cost of one LEAPS call		\$1,200
Plus option commission		15
Net cost of call:		\$1,215 debit
Total credit balance:	\$3,760 credit	

Now the costs and benefits of making the switch can be computed:

Costs of switching:	
Time value premium	– $200
Loss of dividend	– $ 50
Stock commissions	– $ 25
Option commissions	– $ 15
Total cost:	– $290
Fixed benefit from switching:	
Interest earned on credit balance of $3,760 at 5% interest for one year = 0.05 × $3,760:	+ $188
Net cost of switching:	– $102

The stock owner must now decide if it is worth just over $1 per share in order to have his downside risk limited to a price of 39½ over the next year. The price of 39½ as his downside risk is merely the amount of the net credit he received from doing the switch ($3,760) plus the interest earned ($188), expressed in per-share terms. That is, if XYZ falls dramatically over the next year and the LEAPS expires worthless, this investor will still have $3,948 in a bank account. That is equivalent to limiting his risk to about 39½ on the original 100 shares.

If the investor decides to make the substitution, he should invest the proceeds from the sale in a 1-year CD or Treasury bill, for two reasons. First, he locks in the current rate – the one used in his calculations – for the year. Second, he is not tempted to use the money for something else, an action that might negate the potential benefits of the substitution.

The above calculations all assume that the LEAPS call or the stock would have been held for the full year. If that is known not to be the case, the appropriate costs or benefits must be recalculated.

Caveats. This ($102) seems like a reasonably small price to pay to make the switch from common stock to call ownership. However, if the investor were planning to sell the stock before it fell to 39½ in any case, he might not feel the need to pay for this protection. (Be aware, however, that he could accomplish essentially the same thing, since he can sell his LEAPS call whenever he wants to.) Moreover, when the year is up, he will have to pay another stock commission to repurchase his XYZ common if he still wants to own it (or he will have to pay two option commissions to roll his long call out to a later expiration date). One other detriment that might exist, although a relatively unlikely one, is that the underlying common might declare an increased dividend or, even worse, a special cash dividend. The LEAPS call owner would not be entitled to that dividend increase in whatever form, while, obviously, the common

stock owner would have been. If the company declared a stock dividend, it would have no effect on this strategy since the call owner is entitled to those. A change in interest rates is not a factor either, since the owner of the LEAPS should invest in a 1-year Treasury bill or a 1-year CD and therefore would not be subject to interim changes in short-term interest rates.

There may be other mitigating circumstances. Mostly these would involve tax considerations. If the stock is currently a profitable investment, the sale would generate a capital gain, and taxes might be owed. If the stock is currently being held at a loss, the purchase of the call would constitute a wash sale and the loss could not be taken at this time. (See Chapter 41 on taxes for a broader discussion of the wash sale rule and option trading.)

In theory, the calculations above could produce an overall credit, in which case the stockholder would normally want to substitute with the call, unless he has overriding tax considerations or suspects that a cash dividend increase is going to be announced. *Be very careful about switching if this situation should arise.* Normally, arbitrageurs – persons trading for exchange members and paying no commission – would take advantage of such a situation before the general public could. If they are letting the opportunity pass by, there must be a reason (probably the cash dividend), so be extremely certain of your economics and research before venturing into such a situation.

In summary, holders of common stock on which there exist in-the-money LEAPS should evaluate the economics of substituting the LEAPS call for the common stock. Even if arithmetic calculations call for the substitution, the stockholder should consider his tax situation as well as his outlook for the cash dividends to be paid by the common before making the switch.

BUYING LEAPS AS THE INITIAL PURCHASE INSTEAD OF BUYING A COMMON STOCK

Logic similar to that used earlier to determine whether a stockholder might want to substitute a LEAPS call for his stock can be used by a prospective purchaser of common stock. In other words, this investor does not already own the common. He is going to buy it. This prospective purchaser might want to buy a LEAPS call and put the rest of the money he had planned to use in the bank, instead of actually buying the stock itself.

His costs – real and opportunity – are calculated in a similar manner to those expressed earlier. The only real difference is that he has to spend the stock commission in this case, whereas he did not in the previous example (since he already owned the stock).

Example: As before, XYZ is selling at 50; there are 1-year LEAPS with a striking price of 40 that sell for $12; XYZ pays an annual dividend of $0.50, and short-term interest rates are 5%.

The *initial* purchaser of common stock would have certain "opportunity" costs and savings if he decided instead to buy the LEAPS calls. First, calculate the difference in investment required for the stock versus the LEAPS:

Prospective initial investment:		
Stock: $5,000 + $25 commission	=	$5,025
LEAPS: $1,200 + $15 commission	=	$1,215
Net difference:		$3,810

Now calculate the costs versus the savings:

Costs:	
Time value premium	–$200
Loss of dividend	–$ 50
Savings:	
Interest on $3,810 for one year at 5%:	+$190
Net opportunity cost:	–$ 60

In this case, it seems even more likely that the prospective stock purchaser would instead buy the LEAPS call. His net "cost" of doing so, provided he puts the difference in initial investment in a 1-year CD or Treasury bill, is only $60. For this small amount, he has all the upside appreciation (except $60 worth), but has risk only down to 40 (he will have $4,000 in his bank account at the end of one year even if the LEAPS expire worthless).

This strategy of buying in-the-money LEAPS and putting the difference between the LEAPS cost and the stock cost in an interest-bearing instrument is an attractive one. It might seem it would be especially attractive if interest rates for the differential were high. Unfortunately, those high rates would present something of a catch-22 because, as was shown earlier, higher rates will cause the LEAPS to be more expensive.

In this margin strategy, one has the risk of not participating in cash dividend increases or specials as the stockholder who substitutes does. But the other concerns of the stockholder, such as taxes, are not pertinent here. Again, these specific calculations only apply if the stock were to be held for the entire year. Adjustments would have to be made if the holding period envisioned is shorter.

Using Margin. The same prospective initial purchaser of common stock might have been contemplating the purchase of the stock on margin. If he used the LEAPS instead, he could save the margin interest. Of course, he wouldn't have as much money to put in the bank, but he should also compare his costs against those of buying the LEAPS call instead.

Example: As before, XYZ is selling at 50; there are 1-year LEAPS with a striking price of 40 that sell for $12; XYZ pays an annual dividend of $0.50; and short-term interest rates are 5%. Furthermore, assume the margin rate is 8% on borrowed debit balances.

First, calculate the difference in prospective investments:

Cost of buying the stock:	
$5,000 + $25 commission:	$5,025
Amount borrowed (50%)	-2,512
Equity required	$2,513
Cost of buying LEAPS:	
$1,200 + $15 commission:	$1,215
Difference (available to be placed in bank account)	$1,298

Now the costs and opportunities can be compared, if it is assumed that he buys the LEAPS:

Costs:	
Time value premium	-$200
Dividend loss	- 50
Savings:	
Interest on $1,298 at 5%	+$ 65
Margin interest on $2,512 debit balance at 8% for one year	+ 201
Net Savings:	+$ 16

For the prospective margin buyer, there is a real savings in this example. The fact that he does not have to pay the margin interest on his debit balance makes the purchase of the LEAPS call a cost-saving alternative. Finally, it should be noted that current margin rules allow one to purchase a LEAPS option on margin. That can be accounted for in the above calculations as well; merely reduce the investment required and increase the margin charges on the debit balance.

In summary, a prospective purchaser of common stock may often find that if there is an in-the-money option available, the purchase of that option is more attractive than buying the common stock itself. If he were planning to buy on margin, it is even more likely that the LEAPS purchase will be attractive. The main drawback is that he will not participate if cash dividends are increased or a special dividend is declared. Read on, however, because the next strategy may be better than the one above.

PROTECTING EXISTING STOCK HOLDINGS WITH LEAPS PUTS

What was accomplished in the substitution strategy previously discussed? The stock owner paid some cost ($102 in the actual example) in order to limit the risk of his stock ownership to a price of 39½. What if he had bought a LEAPS put instead? Forgetting the price of the put for a moment, concentrate on what the strategy would accomplish. He would be protected from a large loss on the downside since he owns the put, and he could participate in upside appreciation since he still owns the stock. Isn't this what the substitution strategy was trying to accomplish? *Yes, it is.* In this strategy, only one commission is paid – that being on a fairly cheap out-of-the-money LEAPS put – and there is no risk of losing out on dividend increases or special dividends.

The comparison between substituting a call or buying a put is a relatively simple one. First, do the calculations as they were performed in the initial example above. That example showed that the stockholder's cost would be $102 to substitute the LEAPS call for the stock, and such a substitution would protect him at a price of 39½. In effect, he is paying $152 for a LEAPS put with a strike of 40 – the $102 cost plus the difference between 40 and the 39½ protection price. Now, if an XYZ 1-year LEAPS put with strike 40 were available at 1½, he could accomplish everything he had initially wanted merely by buying the put.

Moreover, he would save commissions and still be in a position to participate in increased cash dividends. These additional benefits should make the put worth even more to the stockholder, so that he might pay even slightly more than 1½ for the put. If the LEAPS put were available at this price, it would clearly be the better choice and should be bought instead of substituting the LEAPS call for the common stock.

Thus, any stockholder who is thinking of protecting his position can do it in one of two ways: Sell the stock and substitute a call, or continue to hold his stock and buy a put to protect it. LEAPS calls and puts are amenable to this strategy. Because of the LEAPS' long-term nature, one does not have to keep reestablishing his position and pay numerous commissions, as he would with short-term options. The stockholder should perform the simple calculations as shown above in order to decide

whether the move is feasible at all, and if it is, whether to use the call substitution strategy or the put protection strategy.

LEAPS INSTEAD OF SHORT STOCK

Just as in-the-money LEAPS calls may sometimes be a smarter purchase than the stock itself, in-the-money puts may sometimes be a better purchase than *shorting* the common stock. Recall that either the put purchase or the short sale of stock is a bearish strategy, generally implemented by someone who expects the stock to decline in price. The strategist knows, however, that short stock is a component of many strategies and might reflect other opinions than pure bearishness on the common. In any case, an in-the-money put may prove to be a viable substitute for shorting the stock itself. The two main advantages that the put owner has are that he has limited risk (whereas the short seller of stock has theoretically unlimited risk); and he does not have to pay out any dividends on the underlying stock as the short seller would. Also, the commissions for buying the put would normally be smaller than those required to sell the stock short.

There is not much in the way of calculating that needs to be done in order to make the comparison between buying the in-the-money put and shorting the stock. If the time value premium spent is small in comparison with the dividend payout that is saved, then the put is probably the better choice.

Professional arbitrageurs and other exchange members, as well as some large customers, receive interest on their short sales. For these traders, the put would have to be trading with virtually no time premium at all in order for the comparison to favor the put purchase over the stock short sale. However, the public customer who is going to be shorting stock should be aware of the potential for buying an in-the-money put instead.

SPECULATIVE OPTION BUYING WITH LEAPS

Strategists know that buying calls and puts can have various applications; witness the stock substitution strategies above. However, the most popular reason for buying options is for speculative gain. The leverage inherent in owning options and their limited risk feature make them attractive for this purpose as well. The risk, of course, can be 100% of the investment, and time decay works against the option owner as well. LEAPS calls and puts fit all of these descriptions; they simply have longer maturities.

Time decay is the major enemy of the speculative option holder. Purchasing LEAPS options instead of the shorter-term equity options generally exposes the

buyer to less risk of time decay on a daily basis. This is true because the extreme negative effects of time decay magnify as the option approaches its expiration. Recall that it was shown in Chapter 3 that time decay is not linear: An option decays more rapidly at the end of its life than at the beginning. Eventually, a LEAPS put or call will become a normal short-term equity option and time will begin to take a more rapid toll. But in the beginning of the life of LEAPS, there is so much time remaining that the short-term decay is not large in terms of price.

Table 25-2 and Figure 25-4 depict the rate of decay of two options: one is at-the-money (the lower curve) and the other is 20% out-of-the-money (the upper curve). The horizontal axis is months of life remaining until expiration. The vertical axis is the percent of the option price that is lost *daily* due to time decay. The options that qualify as LEAPS are ones with more than 9 months of life remaining, and would thus be the ones on the lower right-hand part of the graph.

The upward-sloping nature of both curves as time to expiration wanes shows that time decay increases more rapidly as expiration approaches. Notice how much more rapidly the out-of-the-money option decays, percentagewise, than the at-the-money. LEAPS, however, do not decay much at all compared to normal equity options. Most LEAPS, even the out-of-the-money ones, lose less than 1/4 of one percent of their value daily. This is a pittance when compared with a 6-month equity option that is 20% out-of-the-money – that option loses well over 1% of its value daily and it still has 6 months of life remaining.

From the accompanying table, observe that the out-of-the-money 2-month option loses over 4% of its value daily!

Thus, LEAPS do not decay at a rapid rate. This gives the LEAPS holder a chance to have his opinion about the stock price work for him without having to worry as much about the passage of time as the average equity option holder would. An advantage of owning LEAPS, therefore, is that one's timing of the option purchase does not have to be as exact as that for shorter-term option buying. This can be a great psychological advantage as well as a strategic advantage. The LEAPS option buyer who feels strongly that the stock will move in the desired direction has the luxury of being able to wait calmly for the anticipated move to take place. If it does not, even in perhaps as long as 6 months' time, he may still be able to recoup a reasonable portion of his initial purchase price because of the slow percentage rate of decay.

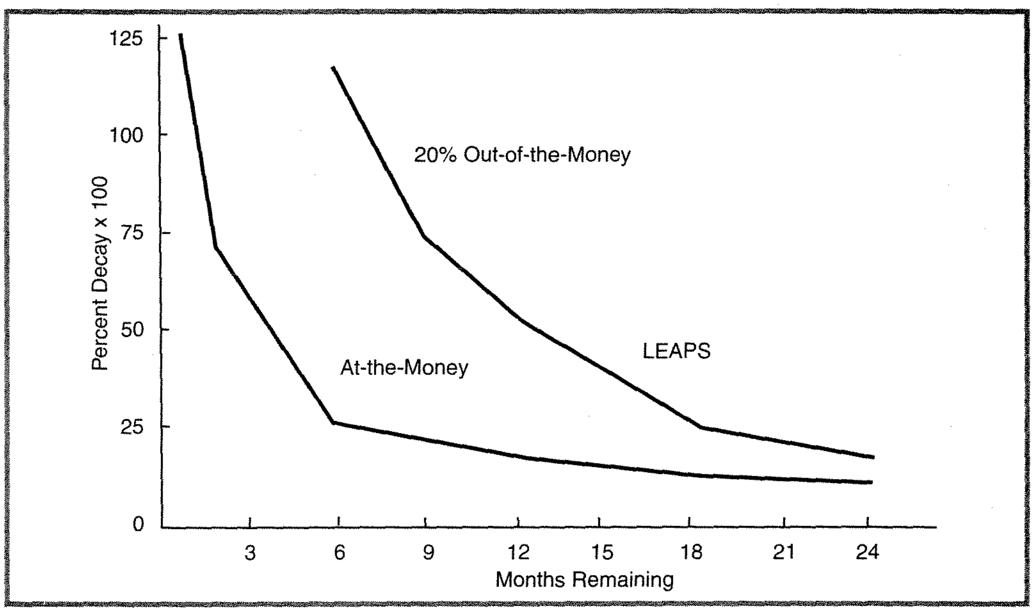
Do not be deluded into believing that LEAPS don't decay at all. Although the *rate* of decay is slow (as shown previously), an option that is losing 0.15% of its value daily will still lose about 25% of its value in six months.

Example: XYZ is at 60 and there are 18-month LEAPS calls selling for $8, with a striking price of 60. The daily decay of this call with respect to time will be minus-

TABLE 25-2.
Daily percent time value decay.

	Percent Decay	
Months remaining	At-the-money	20% Out-of-the-money
24	.12	.18
18	.14	.27
12	.19	.55
9	.22	.76
6	.27	1.18
3	.60	3.57
2	.73	4.43
1	1.27	
2 wks	3.33	

FIGURE 25-4.
Daily percent time value decay.



cule; it will take about a week for even an eighth of a point to be lost due to time. However, if the option is held for six months and nothing else happens, the LEAPS call will be selling for about 6. Thus, it will have lost 25% of its value if the stock remains around 60 at the end of six months.

Those familiar with holding equity calls and puts are more accustomed to seeing an option lose 25% of its value in possibly as little as four or five weeks' time. Thus, the advantage of holding the LEAPS is obvious from the viewpoint of slower time decay.

This observation leads to the obvious question: "When is the best time to sell my call and repurchase a longer-term one?" Referring again to the figure above may help answer the question. Note that for the at-the-money option, the curve begins to bend dramatically upward soon after the 6-month time barrier is passed. Thus, it seems logical that to minimize the effects of time decay, all other things being equal, one would sell his long at-the-money call when it has about 6 months of life left and simultaneously buy a 2-year LEAPS call. This keeps his time decay exposure to a minimum.

The out-of-the-money call is more radical. Figure 25-4 shows that the call that is 20% out-of-the-money begins to decay much more rapidly (percentagewise) at sometime just before it reaches one year until expiration. The same logic would dictate, then, that if one is trading out-of-the-money options, he would sell his option held long when it has about one year to go and reestablish his position by buying a 2-year LEAPS option at the same time.

ADVANTAGES OF BUYING "CHEAP"

It has been demonstrated that rising interest rates or rising volatility would make the price of a LEAPS call increase. Therefore, if one is attempting to participate in LEAPS speculative call buying strategies, he should be more aggressive when rates and volatilities are low.

A few sample prices may help to demonstrate just how powerful the effects of rates and volatilities are, and how they can be a friend to the LEAPS call buyer. Suppose that one buys a 2-year LEAPS call at-the-money when the following situation exists:

XYZ: 100
January 2-year LEAPS call with strike of 100: 14
Short-term interest rates: 3%
Volatility: below average (historically)

For the purposes of demonstration, suppose that the current volatility is low for XYZ (historically) and that 3% is a low level for rates as well. If the stock moves up, there is no problem, because the LEAPS call will increase in price. But what if the stock drops or stays unchanged? Is all hope of a profit lost? Actually, no. If interest rates increase or the volatility that the calls trade at increases, we know the LEAPS call will increase in value as well. Thus, even though the direction in which the stock is moving may be unfavorable, it might still be possible to salvage one's investment. Table 25-3 shows where volatility would have to be or where short-term rates would have

TABLE 25-3.
Factors necessary for January 2-year LEAPS to be = 14.

Stock price	After 1 month	After 6 months
100 (unchanged)	r = 3.4% or	r = 6% or
	v + 5%	v + 20%
95	r = 6% or	r = 9.4% or
	v + 20%	v + 45%
90	r = 8.5% or	r = 12.6% or
	v + 45%	v + 70%

to go in order to keep the value of the LEAPS call at 14 even after the indicated amount of time had expired.

To demonstrate the use of this table, suppose the stock price were 100 (unchanged) after one month. If interest rates had risen to 3.4% from their original level of 3% during that time, the call would still be worth 14 even though one month had passed. Alternatively, if rates were the same, but volatility had increased by only 5% from its original level, then the call would also still be worth 14. Note that this means that volatility would have to increase only slightly (by 1/20th) from its original level, not by 5 percentage points.

Even if the stock were to drop to 90 and six months had passed, the LEAPS call holder would still be even if rates had risen to 12.6% (highly unlikely) or volatility had risen by 70%. It is often possible for volatilities to fluctuate to that extent in six months, but not likely for interest rates.

In fact, as interest rates go, only the top line of the table probably represents realistic interest rates; an increase of 0.4% in one month, or 3% in 6 months, is possible. The other lines, where the stock drops in price, probably require too large a jump in rates for rates alone to be able to salvage the call price. However, any increase in rates will be helpful. Volatility is another matter. It is often feasible for volatilities to change by as much as 50% from their previous level in a month, and certainly in six months. Hence, as has been stated before, the volatility factor is the more dominant one.

This table shows the effect of rising interest rates and volatilities on LEAPS calls. It would be beneficial to the LEAPS call owner and, of course, detrimental to the LEAPS call seller. This is clear evidence that one should be aware of the general level of rates and volatility before using LEAPS options in a strategy.

THE DELTA

The delta of an option is the amount by which the option price will change if the underlying stock changes in price by one point. In an earlier section of this chapter, comparing the differences between LEAPS and short-term calls, mention was made of delta. The subject is explored in more depth here because it is such an important concept, not only for option buyers, but for most strategic decisions as well.

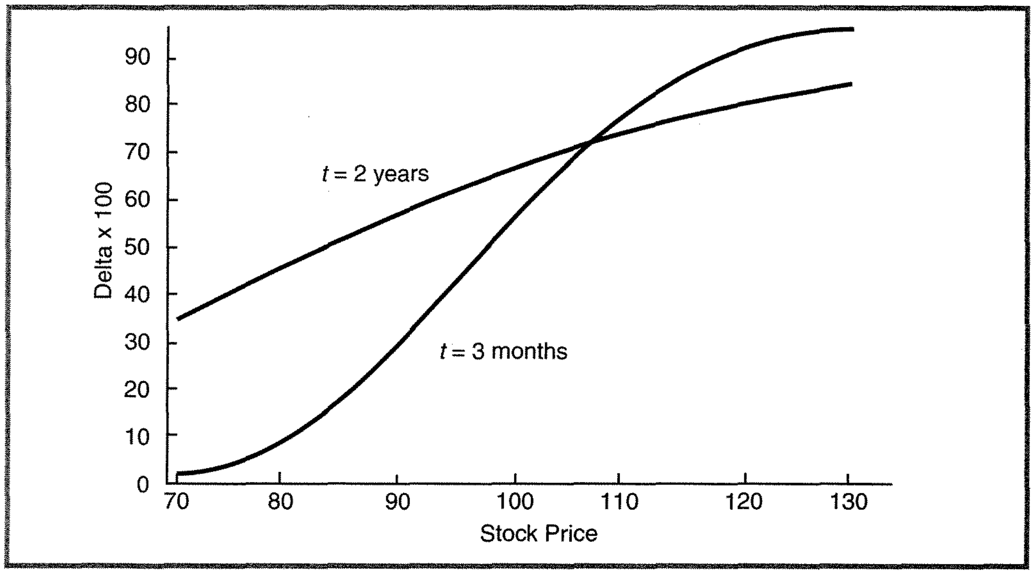
Figure 25-5 depicts the deltas of two different options: 2-year LEAPS and 3-month equity options. Their terms are the same except for their expiration dates; striking price is 100, and volatility and interest rate assumptions are equal. The horizontal axis displays the stock price while the vertical axis shows the delta of the options.

Several relevant observations can be made. First, notice that the delta of the at-the-money LEAPS is very large, nearly 0.70. This means that the LEAPS call will move much more in line with the common stock than a comparable short-term equity option would. Very short-term at-the-money options have deltas of about ½, while slightly longer-term ones have deltas ranging up to the 0.55 to 0.60 area. *What this implies is that the longer the life of an at-the-money option, the greater its delta.*

In addition, the figure shows that the deltas of the 3-month call and the 2-year LEAPS call are about equal when the options are approximately 5% in-the-money. If the options are more in-the-money than that, then the LEAPS call has a lower delta. This means that at- and out-of-the-money LEAPS will move more in line with the common stock than comparable short-term options will. Restated, the LEAPS calls will move faster than the ordinary short-term equity calls unless both options are more than 5% in-the-money. Note that the movement referred to is in absolute terms in change of price, not in percentage terms.

The delta of the 2-year LEAPS does not change as dramatically when the stock moves as does the delta of the 3-month option (see Figure 25-5). Notice that the LEAPS curve is relatively flat on the chart, rising only slightly above horizontal. In contrast, the delta of the 3-month call is very low out-of-the-money and very large in-the-money. What this means to the call buyer is that the amount by which he can expect the LEAPS call to increase or decrease in price is somewhat stable. This can affect his choice of whether to buy the in-the-money call or the out-of-the-money call. With normal short-term options, he can expect the in-the-money call to much more closely mirror the movement in the stock, so he might be tempted to buy that call if he expects a small movement in the stock. With LEAPS, however, there is much less discrepancy in the amount of option price movement that will occur.

FIGURE 25-5.
Call delta comparison, 2-year LEAPS versus 3-month equity options.



Example: XYZ is trading at 82. There are 3-month calls with strikes of 80 and 90, and there are 2-year LEAPS calls at those strikes as well. The following table summarizes the available information:

XYZ: 82 Date: January, 2002		
Option	**Price**	**Delta**
April ('02) 80 call	4	$5/8$
April ('02) 90 call	1	$1/8$
January ('04) 80 LEAPS call	14	$3/4$
January ('04) 90 LEAPS call	7	$1/2$

Suppose the trader expects a 3-point move by the underlying common stock, from 82 to 85. If he were analyzing short-term calls, he would see his potential as a gain of $1\frac{7}{8}$ in the April 80 call versus a gain of $3/8$ in the April 90 call. Each of these gains is projected by multiplying the call's delta times 3 (the expected stock move, in points). Thus, there is a large difference between the expected gains from these two options, particularly after commissions are considered.

Now observe the LEAPS. The January 80 would increase by $2\frac{1}{4}$ while the January 90 would increase by $1\frac{1}{2}$ if XYZ moved higher by 3 points. This is not nearly as large a discrepancy as the short-term options had. Observe that the January 90 LEAPS sells for half the price of the January 80. These movements projected by the

delta indicate that the January 90 LEAPS will move by a larger *percentage* than the January 80 and therefore would be the better buy.

PUT DELTAS

Many of the previous observations regarding deltas of LEAPS calls can be applied to LEAPS puts as well. However, Figure 25-5 changes a little when the following formula is applied. Recall that the relationship between put deltas and call deltas, except for deeply in-the-money puts, is:

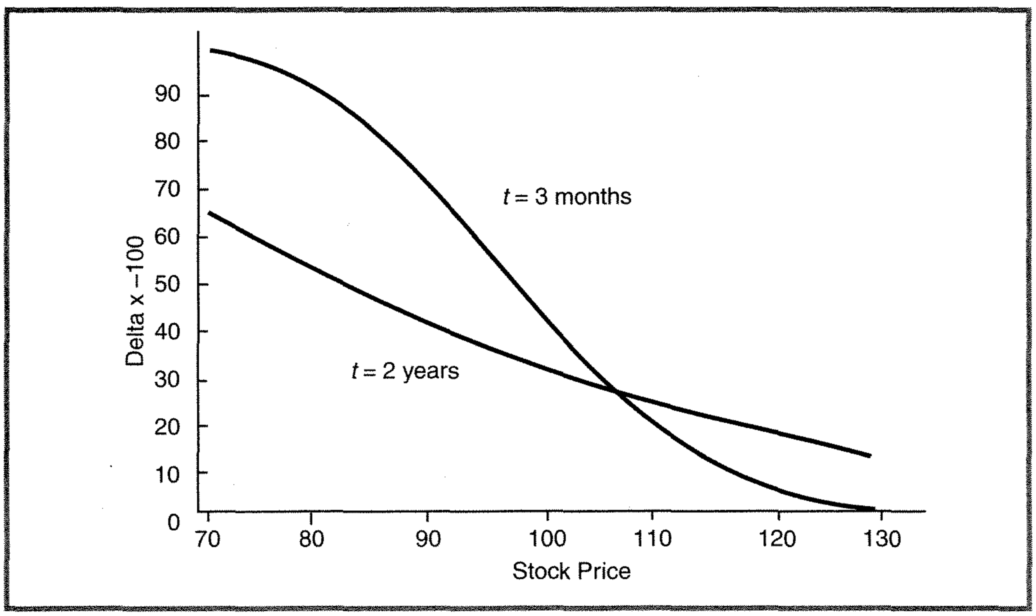
$$\text{Put delta} = \text{Call delta} - 1$$

This has the effect of *inverting* the relationships that have just been described. In other words, while the short-term calls didn't move as fast as the LEAPS, the *short-term puts move faster than the LEAPS puts in most cases.* Figure 25-6 shows the deltas of these options.

The vertical axis shows the puts' delta. Notice that out-of-the-money LEAPS puts and short-term equity puts don't behave very differently in terms of price change (bottom right-hand section of figure).

In-the-money puts (when the stock is below the striking price) move faster if they are shorter-term. This fact is accentuated even more when the puts are more deeply in-the-money. The left-hand side of the figure depicts this fact.

FIGURE 25-6.
Put delta comparison, 2-year LEAPS versus 3-month equity options.



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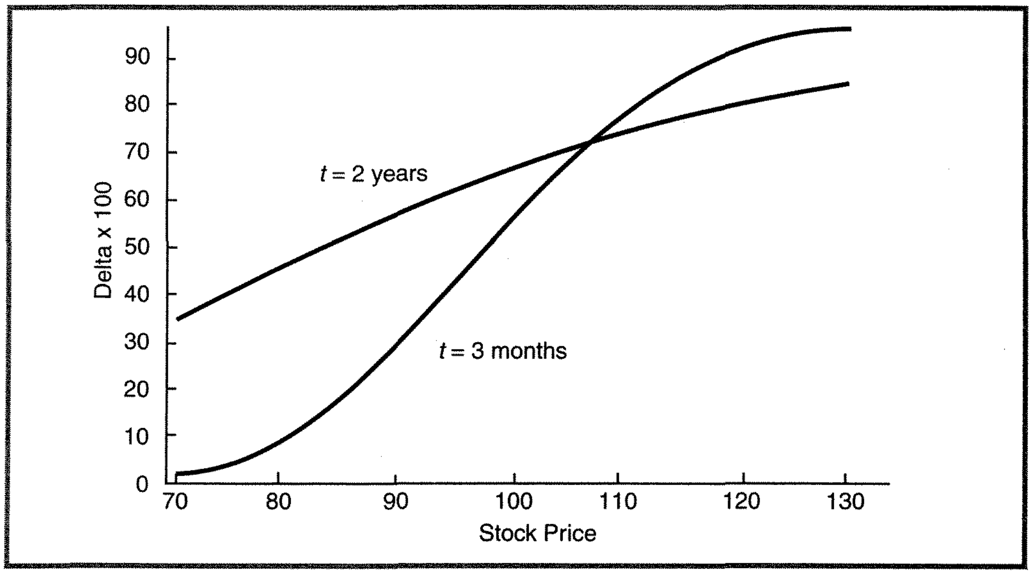

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XYZ: 82 Date: January, 2002		
Option	**Price**	**Delta**
April ('02) 80 call	4	5/8
April ('02) 90 call	1	1/8
January ('04) 80 LEAPS call	14	3/4
January ('04) 90 LEAPS call	7	1/2

Suppose the trader expects a 3-point move by the underlying common stock, from 82 to 85. If he were analyzing short-term calls, he would see his potential as a gain of 1⅞ in the April 80 call versus a gain of ⅜ in the April 90 call. Each of these gains is projected by multiplying the call's delta times 3 (the expected stock move, in points). Thus, there is a large difference between the expected gains from these two options, particularly after commissions are considered.

Now observe the LEAPS. The January 80 would increase by 2¼ while the January 90 would increase by 1½ if XYZ moved higher by 3 points. This is not nearly as large a discrepancy as the short-term options had. Observe that the January 90 LEAPS sells for half the price of the January 80. These movements projected by the

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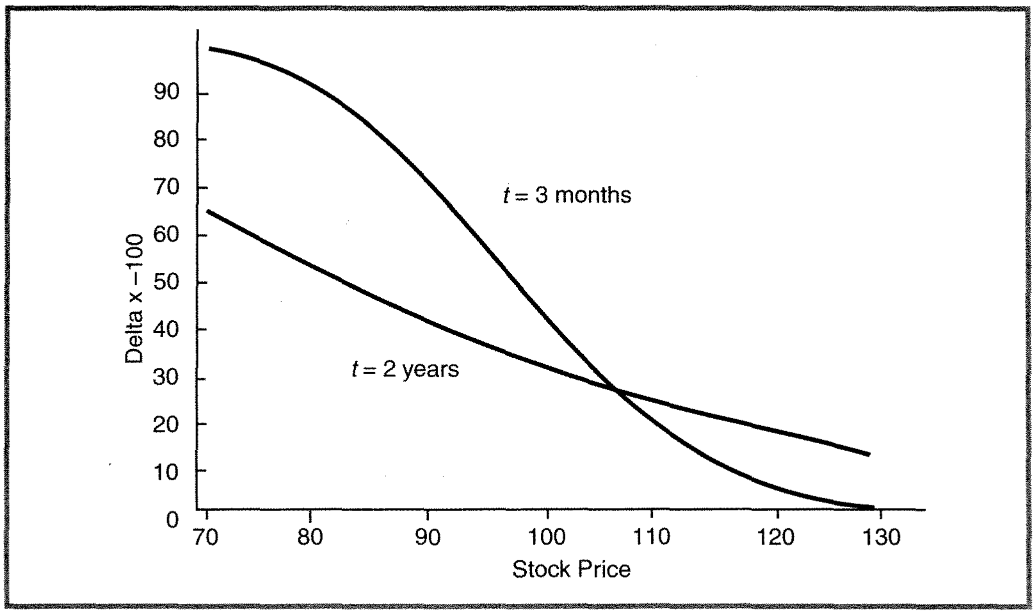
Put delta comparison, 2-year LEAPS versus 3-month equity options.



The LEAPS put delta curve is flat, just as the call delta curve was. Moreover, the delta is not very large anywhere across the figure. For example, at-the-money 2-year LEAPS puts move only about 30 cents for a one-point move in the underlying stock. *LEAPS put buyers who want to speculate on a stock's downward movement must realize that the leverage factor is not large;* it takes approximately a 3-point move by the underlying common for an at-the-money LEAPS put to increase in value by one point. Long-term puts don't mirror stock movement nearly as well as shorter-term puts do.

In summary, the option buyer who is considering buying LEAPS puts or calls as speculation should be aware of the different price action that LEAPS exhibit when compared to shorter-term options. Due to the large amount of time that LEAPS have remaining in their lives, the time decay of the LEAPS options is smaller. For this reason, the LEAPS option buyer doesn't need to be as precise in his timing. In general, LEAPS calls move faster when the underlying stock moves, and LEAPS puts move more slowly. Other than that, the general reasons for speculative option buying apply to LEAPS as well: leverage and limited risk.

SELLING LEAPS

Strategies involving selling LEAPS options do not differ substantially from those involving shorter-term options. The discussions in this section concentrate on the two major differences that sellers of LEAPS will notice. First, the slow rate of time decay of LEAPS options means that option writers who are used to sitting back and watching their written options waste away will not experience the same effect with LEAPS. Second, follow-up action for writing strategies usually depends on being able to buy back the written option when it has little or no time value premium remaining. Since LEAPS retain time value even when substantially in- or out-of-the-money, follow-up action involving LEAPS may involve the repurchase of substantial amounts of time value premium.

COVERED WRITING

LEAPS options can be sold against underlying stock just as short-term options can. No extra collateral or investment is required to do so. The resulting position is again one with limited profit potential, but enhanced profitability (as compared to stock ownership), if the underlying stock remains unchanged or falls. The maximum profit potential of the covered write is reached whenever the underlying stock is at or above the striking price of the written option at expiration.

The LEAPS covered writer takes in substantial premium, in terms of price, when he sells the long-term option. He should compare the return that he could

make from the LEAPS write with returns that can be made from repeatedly writing shorter-term calls. Of course, there is no guarantee that he will actually be able to repeat the short-term writes during the longer life of the LEAPS.

As an aside, the strategist who is utilizing the *incremental return* concept of covered writing may find LEAPS call writing quite attractive. This is the strategy wherein he has a higher target price at which he would be willing to sell his common stock, and he writes calls along the way to earn an incremental return (see Chapter 2 for details). Since this type of writer is only concerned with absolute levels of premiums being brought into the account and not with things like return if exercised, he should utilize LEAPS calls if available, since the premiums are the largest available. Moreover, if the incremental return writer is currently in a short-term call and is going to be called away, he might roll into a LEAPS call in order to retain his stock and take in more premium.

The rest of this section discusses covered writing from the more normal viewpoint of the investor who buys stock and sells a call against it in order to attain a particular return.

Example: XYZ is selling at 50. The investor is considering a 500-share covered write and he is unsure whether to use the 6-month call or the 2-year LEAPS. The July 50 call sells for 4 and has 6 months of life remaining; the January 50 LEAPS call sells for $8\frac{1}{2}$ and has 2 years of life. Further assume that XYZ pays a dividend of $0.25 per quarter.

As was done in Chapter 2, the net required investment is calculated, then the return (if exercised) is computed, and finally the downside break-even point is determined.

Net Investment Required

	July 50 call	January 50 LEAPS
Stock cost (500 shares @ 50)	$25,000	$25,000
Plus stock commission	+ 300	+ 300
Less option premiums received	– 2,000	– 4,250
Plus option commissions	+ 50	+ 100
Net cash investment	$23,350	$21,150

Obviously, the LEAPS covered writer has a smaller cash investment, since he is selling a more expensive call in his covered write. Note that the option premium is being applied against the net investment in either case, as is the normal custom when doing covered writing.

Now, using the net investment required, one can calculate the return (if exercised). That return assumes the stock is above the striking price of the written option

at its expiration, and the stock is called away. The short-term writer would have collected two dividends of the common stock, while the LEAPS writer would have collected eight by expiration.

Return If Exercised

	July 50 call	January 50 LEAPS
Stock sale (500 @ 50)	$25,000	$25,000
Less stock commission	– 300	– 300
Plus dividends earned until expiration	+ 250	+ 1,000
Less net investment	– 23,350	– 21,150
Net profit if exercised	$ 1,600	$ 4,550
Return if exercised (net profit/net investment)	6.9%	21.5%

The LEAPS writer has a much higher net return if exercised, again because he wrote a more expensive option to begin with. However, in order to fairly compare the two writes, one must annualize the returns. That is, the July 50 covered write made 6.9% in six months, so it could make twice that in one year, *if it can be duplicated six months from now.* In a similar manner, the LEAPS covered writer can make 21.5% in two years if the stock is called away. However, on an annualized basis, he would make only half that amount.

Return If Exercised, Annualized

July 50 call	January 50 LEAPS
13.8%	10.8%

Thus, on an annualized basis, the short-term write seems better. The shorter-term call will generally have a higher rate of return, annualized, than the LEAPS call. The problems with annualizing are discussed in the following text.

Finally, the downside break-even point can be computed for each write.

Downside Break-Even Calculation

	July 50 call	January 50 LEAPS
Net investment	$23,350	$21,150
Less dividends received	– 250	– 1,000
Total stock cost to expiration	$23,100	$20,150
Divided by shares held (500), equals break-even price:	46.2	40.3

The larger premium of the LEAPS call that was written produces this dramatically lower break-even price for the LEAPS covered write.

Similar comparisons could be made for a covered write on margin if the investor is using a margin account. The steps above are the mechanical ones that a covered writer should go through in order to see how the short-term write compares to the longer-term LEAPS write. Analyzing them is often a less routine matter. It would seem that the short-term write is better if one uses the *annualized* rate of return. However, the annualized return is a somewhat subjective number that depends on several assumptions.

The first assumption is that one will be able to generate an equivalent return six months from now when the July 50 call expires worthless or the stock is called away. If the stock were relatively unchanged, the covered writer would have to sell a 6-month call for 4 points again six months from now. Or, if the stock were called away, he would have to invest in an equivalent situation elsewhere. Moreover, in order to reach the 2-year horizon offered by the LEAPS write, the 6-month return would have to be regenerated *three* more times (six months from now, one year from now, and a year and a half from now). The covered writer cannot assume that such returns can be repeated with any certainty every six months.

The second assumption that was made when the annualized returns were calculated was that one-half the return if exercised on the LEAPS call would be made when one year had passed. But, as has been demonstrated repeatedly in this chapter, the time decay of an option is not linear. Therefore, one year from now, if XYZ were still at 50, the January 50 LEAPS call would not be selling for half its current price ($\frac{1}{2} \times 8\frac{1}{2} = 4\frac{1}{4}$). It would be selling for something more like 5.00, if all other factors remained unchanged. However, given the variability of LEAPS call premiums when interest rates, volatility, or dividend payouts change, it is extremely difficult to estimate the call price one year from now. Consequently, to say that the 21.5% 2-year return if exercised would be 10.8% after one year may well be a false statement.

Thus, the covered writer must make his decision based on what he knows. He knows that with the short-term July 50 write, if the stock is called away in six months, he will make 6.9%, period. If he opts for the longer term, he will make 21.5% if he is called away in two years. Which is better? The question can only be answered by each covered writer individually. One's attitude toward long-term investing will be a major factor in making the decision. If he thinks XYZ has good prospects for the long term, and he feels conservative returns will be below 10% for the next couple of years, then he would probably choose the LEAPS write. However, if he feels that there is a temporary expansion of option premium in the short-term XYZ calls that should be exploited, and he would not really want to be a long-term holder of the stock, then he would choose the short-term covered write.

Downside Protection. The actual downside break-even point might enter into one's thinking as well. A downside break-even point of 40.3 is available by using the LEAPS write, and that is a known quantity. No matter how far XYZ might fall, as long as it can recover to slightly over 40 by expiration two years from now, the investment will at least break even. A problem arises if XYZ falls to 40 quickly. If that happened, the LEAPS call would still have a significant amount of time value premium remaining on it. Thus, if the investor attempted to sell his stock at that time and buy back his call, he would have a loss, not a break-even situation.

The short-term write offers downside protection only to a stock price of 46.2. Of course, repeated writes of 6-month calls over the next 2 years would lower the break-even point below that level. The problem is that if XYZ declines and one is forced to keep selling 6-month calls every 6 months, he may be forced to use a lower striking price, thereby locking in a smaller profit (or possibly even a loss) if premium levels shrink. The concepts of rolling down are described in detail in Chapter 2.

A further word about rolling down may be in order here. Recall that rolling down means buying back the call that is currently written and selling another one with a lower striking price. Such action *always* reduces the profitability of the overall position, although it may be necessary to prevent further downside losses if the common stock keeps declining. Now that LEAPS are available, the short-term writer faced with rolling down may look to the LEAPS as a means of bringing in a healthy premium even though he is rolling down. It is true that a large premium could be brought into the account. But remember that by doing so, one is committing himself to sell the stock at a lower price than he had originally intended. This is why the rolling down reduces the original profit potential. *If he rolls down into a LEAPS call, he is reducing his maximum profit potential for a longer period of time.* Consequently, one should not always roll down into an option with a longer maturity. Instead, he should carefully analyze whether he wants to be committed for an even longer time to a position in which the underlying common stock is declining.

To summarize, the large absolute premiums available in LEAPS calls may make a covered write of those calls seem unusually attractive. However, one should calculate the returns available and decide whether a short-term write might not serve his purpose as well. Even though the large LEAPS premium might reduce the initial investment to a mere pittance, be aware that this creates a great amount of leverage, and leverage can be a dangerous thing.

The large amount of downside protection offered by the LEAPS call is real, but if the stock falls quickly, there would definitely be a loss at the calculated downside break-even point. Finally, one cannot always roll down into a LEAPS call if trouble develops, because he will be committing himself for an even longer period of time to sell his stock at a lower price than he had originally intended.

"FREE" COVERED CALL WRITES

In Chapter 2, a strategy of writing expensive LEAPS options was briefly described. In this section, a more detailed analysis is offered. A certain type of covered call write, one in which the call is quite expensive, sometimes attracts traders looking for a "free ride." To a certain extent, this strategy *is* something of a free ride. As you might imagine, though, there can be major problems.

The investment required for a covered call write on margin is 50% of the stock price, less the proceeds received from selling the call. In theory, it is possible for an option to sell for more than 50% of the stock cost. This is a margin account, a covered write could be established for "free." Let's discuss this in terms of two types of calls: the in-the-money call write and the out-of-the-money call write.

Out-of-the-Money Covered Call Write. This is the simplest way to approach the strategy. One may be able to find LEAPS options that are just slightly out-of-the-money, which sell for 50% of the stock price. Understandably, such a stock would be quite volatile.

Example: GOGO stock is selling for $38 per share. GOGO has listed options, and a 2-year LEAPS call with a striking price of 40 is selling for $19. The requirement for this covered write would be zero, although some commission costs would be involved. The debit balance would be 19 points per share, the amount the broker loans you on margin.

Certain brokerage firms might require some sort of minimum margin deposit, but technically there is no further requirement for this position. Of course, the leverage is infinite. Suppose one decided to buy 10,000 shares of GOGO and sell 100 calls, covered. *His risk is $190,000 if the stock falls to zero!* That also happens to be the debit balance in his account. Thus, for a minimal investment, one could lose a fortune. In addition, if the stock begins to fall, one's broker is going to want maintenance margin. He probably wouldn't let the stock slip more than a couple of points before asking for margin. If one owns 10,000 shares and the broker wants two points maintenance margin, that means the margin call would be $20,000.

The profits wouldn't be as big as they might at first seem. The maximum gross profit potential is $210,000 if the 10,000 shares are called away at 40. The covered write makes 21 points on each share – the $40 sale price less the original cost of $19. However, one will have had to pay interest on the debit balance of $190,000 for two years. At 10%, say, that's a total of $38,000. There would also be commissions on the purchase and the sale.

In summary, this is a position with *tremendous,* even dangerous, leverage.

In-the-Money Covered Call Write. The situation is slightly different if the option is in-the-money to begin with. The above margin requirements actually don't quite accurately state the case for a margined covered call write. When a covered call is written against the stock, there is a catch: *Only 50% of the stock price or the strike price, whichever is less, is available for "release."* Thus, one will actually be required to put up more than 50% of the stock price to begin with.

Example: XYZ is trading at 50, and there is a 2-year LEAPS call with a strike price of 30, selling for 25 points. One might think that the requirement for a covered call write would be zero, since the call sells for 50% of the stock price. But that's *not* the case with in-the-money covered calls.

Margin requirement:	
Buy stock: 50 points	
Less option proceeds	–25
Less margin release*	–15*
Net requirement:	10 points

* 50% of the strike price or 50% of stock price, whichever is *less.*

This position still has a lot of leverage: One invests 10 points in hopes of making 5, if the stock is called away at 30. One also would have to pay interest on the 15-point debit balance, of course, for the two-year duration of the position. Furthermore, should the stock fall below the strike price, the broker would begin to require maintenance margin.

Note that the above "formula" for the net requirement works equally well for the out-of-the-money covered call write, since 50% of the stock price is always less than 50% of the strike price in that case.

To summarize this "free ride" strategy: If one should decide to use this strategy, he must be extremely aware of the dangers of high leverage. One must not risk more money than he can afford to lose, regardless of how small the initial investment might be. Also, he must plan for some method of being able to make the margin payments along the way. Finally, the in-the-money alternative is probably better, because there is less probability that maintenance margin will be asked for.

SELLING UNCOVERED LEAPS

Uncovered option selling can be a viable strategy, especially if premiums are overpriced. LEAPS options may be sold uncovered with the same margin requirements as short-term options. Of course, the particular characteristics of the long-term option may either help or hinder the uncovered writer, depending on his objective.

Uncovered Put Selling. Naked put selling is addressed first because, as a strategy, it is equivalent to covered writing, and covered writing was just discussed. Two strategies are equivalent if they have the same profit picture at expiration. Naked put selling and covered call writing are equivalent because they have the profit picture depicted in Graph I, Appendix D. Both have limited upside profit potential and large loss exposure to the downside. In general, when two strategies are equivalent, one of the two has certain advantages over the other.

In this case, naked put selling is normally the more advantageous of the two because of the way margin requirements are set. One need not actually invest cash in the sale of a naked put; the margin requirement that is asked for may be satisfied with collateral. This means the naked put writer may use stocks, bonds, T-bills, or money market funds as collateral. Moreover, the actual amount of collateral that is required is less than the cash or margin investment required to buy stock and sell a call. This means that one could operate his portfolio normally – buying stock, then selling it and putting the proceeds in a Treasury bill or perhaps buying another stock – without disturbing his naked put position, as long as he maintained the collateral requirement.

Consequently, the *strategist* who is buying stock and selling calls should probably be selling naked puts instead. This does not apply to covered writers who are writing against existing stock or who are using the incremental return concept of covered writing, because stock ownership is part of their strategy. However, the strategist who is looking to take in premium to profit if the underlying stock remains relatively unchanged or rises, while having a modicum of downside protection (which is the definition of both naked put writing and covered writing), should be selling naked puts. As an example of this, consider the LEAPS covered write discussed previously.

Example: XYZ is selling at 50. The investor is debating between a 500-share covered write using 2-year LEAPS calls or selling five 2-year LEAPS puts. The January 50 LEAPS call sells for $8\frac{1}{2}$ and has two years of life, while the January 50 LEAPS put sells for $3\frac{1}{2}$. Further assume that XYZ pays a dividend of $0.25 per quarter.

The net investment required for the covered write is calculated as it was before.

Net Investment Required – Covered Write	
Stock cost (500 shares @ 50)	$25,000
Plus stock commission	+ 300
Less option premiums received	– 4,250
Plus option commissions	+ 100
Net cash investment	$21,150

The collateral requirement for the naked put write is the same as that for any naked equity option: 20% of the stock price, plus the option price, less any out-of-the-money amount, with an absolute minimum requirement of 15% of the stock price.

Collateral Requirement – Naked Put	
20% of stock price (.20 × 500 × $50)	$5,000
Plus option premium	1,750
Less out-of-the-money amount	– 0
Total collateral requirement	$6,750

Note that the actual premium received by the naked put seller is $1,750 less commissions of $100, for example, or $1,650. This net premium could be used to reduce the total collateral requirement.

Now one can compare the profitability of the two investments:

Return If Stock Over 50 at Expiration	
	Covered Write
Stock sale (500 @ 50)	$25,000
Less stock commission	– 300
Plus dividends earned until expiration	+ 1,000
Less net investment	– 21,150
Net profit if exercised	$ 4,550
	Naked Put Sale
Net put premium received	$1,650
Dividends received	0
Net profit	$1,650

Now the returns can be compared, if XYZ is over 50 at expiration of the LEAPS:

Return if XYZ over 50
(net profit/net investment)
Naked put sale: 24.4%
Covered write: 21.5%

The naked put write has a better rate of return, even before the following fact is considered. The strategist who is using the naked put write does not have to spend the $6,750 collateral requirement in the form of cash. That money can be kept in a

Treasury bill and earn interest over the two years that the put write is in place. Even if the T-bill were earning only 4% per year, that would increase the overall two-year return for the naked put sale by 8%, to 32.4%. This should make it obvious that *naked put selling is more strategically advantageous than covered call writing.*

Even so, one might rightfully wonder if LEAPS put selling is better than selling shorter-term equity puts. As was the case with covered call writing, the answer depends on what the investor is trying to accomplish. Short-term puts will not bring as much premium into the account, so when they expire, one will be forced to find another suitable put sale to replace it. On the other hand, the LEAPS put sale brings in a larger premium and one does not have to find a replacement until the longer-term LEAPS put expires. The negative aspect to selling the LEAPS puts is that time decay won't help much right away and, even if the stock moves higher (which is ostensibly good for the position), the put won't decline in price by a large amount, since the delta of the put is relatively small.

One other factor might enter in the decision regarding whether to use short-term puts or LEAPS puts. Some put writers are actually attempting to buy stock below the market price. That is, they would not mind being assigned on the put they sell, meaning that they would buy stock at a net cost of the striking price less the premium they received from the sale of the put. If they don't get assigned, they get to keep a profit equal to the premium they received when they first sold the put. Generally, a person would only sell puts in this manner on a stock that he had faith in, so that if he was assigned on the put, he would view that as a buying opportunity in the underlying stock. This strategy does not lend itself well to LEAPS. Since the LEAPS puts will carry a significant amount of time premium, there is little (if any) chance that the put writer will actually be assigned until the life of the put shortens substantially. This means that it is unlikely that the put writer will become a stock owner via assignment at any time in the near future. Consequently, if one is attempting to write puts in order to eventually buy the common stock when he is assigned, he would be better served to write shorter-term puts.

UNCOVERED CALL SELLING

There are very few differences between using LEAPS for naked call selling and using shorter-term calls, except for the ones that have been discussed already with regard to selling uncovered LEAPS: Time value decay occurs more slowly and, if the stock rallies and the naked calls have to be covered, the call writer will normally be paying more time premium than he is used to when he covers the call. Of course, the reason that one is engaged in naked call writing might shed some more light on the use of LEAPS for that purpose.

The overriding reason that most strategists sell naked calls is to collect the time premium before the stock can rise above the striking price. These strategists generally have an opinion about the stock's direction, believing that it is perhaps trapped in a trading range or even headed lower over the short term. This strategy does not lend itself well to using LEAPS, since it would be difficult to project that the stock would remain below the strike for so long a period of time.

Short LEAPS Instead of Short Stock. Another reason that naked calls are sold is as a strategy akin to shorting the common stock. In this case, in-the-money calls are sold. The advantages are threefold:

1. The amount of collateral required to sell the call is less than that required to sell stock short.
2. One does not have to borrow an option in order to sell it short, although one must borrow common stock in order to sell it short.
3. An uptick is not required to sell the option, but one is required in order to sell stock short.

For these reasons, one might opt to sell an in-the-money call instead of shorting stock.

The profit potentials of the two strategies are different. The short seller of stock has a very large profit potential if the stock declines substantially, while the seller of an in-the-money call can collect only the call premium no matter how far the stock drops. Moreover, the call's price decline will slow as the stock nears the strike. Another way to express this is to say that the delta of the call shrinks from a number close to 1 (which means the call mirrors stock movements closely) to something more like 0.50 at the strike (which means that the call is only declining half as quickly as the stock).

Another problem that may occur for the call seller is early assignment, a topic that is addressed shortly. *One should not attempt this strategy if the underlying stock is not borrowable for ordinary short sales.* If the underlying stock is not available for borrowing, it generally means that extraneous forces are at work; perhaps there is a tender offer or exchange offer going on, or some form of convertible arbitrage is taking place. In any case, if the underlying stock is not borrowable, one should not be deluded into thinking that he can sell an in-the-money call instead and have a worry-free position. In these cases, the call will normally have little or no time premium and may be subject to early assignment. If such assignment does occur, the strategist will become short the stock and, since it is not borrowable, will have to cover the stock. At the least, he will cost himself some commissions by this unprofitable strategy; and at worst, he will have to pay a higher price to buy back the stock as well.

LEAPS calls may help to alleviate this problem. Since they are such long-term calls, they are likely to have some time value premium in them. In-the-money calls that have time value premium are not normally assigned. As an alternative to shorting a stock that is not borrowable, one might try to sell an in-the-money LEAPS call, but *only if it has time value premium remaining.* Just because the call has a long time remaining until expiration does not mean that it must have time value premium, as will be seen in the following discussion. Finally, if one does sell the LEAPS call, he must realize that if the stock drops, the LEAPS call will not follow it completely. As the stock nears the strike, the amount of time value premium will build up to an even greater level in the LEAPS. Still, the naked call seller would make some profit in that case, and it presents a better alternative than not being able to sell the stock short at all.

Early Assignment. An American-style option is one that can be exercised at any time during its life. All listed equity options, LEAPS included, are of this variety. Thus, any in-the-money option that has been sold may become subject to early assignment. The clue to whether early assignment is imminent is whether there is time value premium in the option. If the option has no time value premium – in other words, it is trading at parity or at a discount – then assignment may be close at hand. The option writer who does not want to be assigned would want to cover the option when it no longer carries time premium.

LEAPS may be subject to early assignment as well. It is possible, albeit far less likely, that a long-term option would lose all of its time value premium and therefore be subject to early assignment. This would certainly happen if the underlying stock were being taken over and a tender offer were coming to fruition. However, it may also occur because of an impending dividend payment, or more specifically, because the stock is about to go ex-dividend. Recall that the call owner, LEAPS calls included, is not entitled to any dividends paid by the underlying stock. So if the call owner wants the dividend, he exercises his call on the day before the stock goes ex-dividend. This makes him an owner of the common stock just in the nick of time to get the dividend.

What economic factors motivate him to exercise the call? If there is any time value premium at all in the call, the call holder would be better off selling the call in the open market and then purchasing the stock in the open market as well. In this manner, he would still get the dividend, but he would get a better price for his call when he sold it. If, however, there is no time value premium in the call, he does not have to bother with two transactions in the open market; he merely exercises his call in order to buy stock.

All well and good, but what makes the call sell at parity before expiration? It has to do with the arbitrage that is available for any call option. In this case, the arbitrage

is not the simple discount arbitrage that was discussed in Chapter 1 when this topic was covered. Rather, it is a more complicated form that is discussed in greater detail in Chapter 28. Suffice it to say that if the dividend is larger than the interest that can be earned from a credit balance equal to the striking price, then the time value premium will disappear from the call.

Example: XYZ is a \$30 stock and about to go ex-dividend 50 cents. The prevailing short-term interest rate is 5% and there are LEAPS with a striking price of 20.

A 50-cent quarterly dividend on a striking price of 20 is an annual dividend rate (on the strike) of 10%. Since short-term rates are much lower than that, arbitrageurs economically cannot pay out 10% for dividends and earn 5% for their credit balances.

In this situation, the LEAPS call would lose its time value premium and would be a candidate for early exercise when the stock goes ex-dividend.

In actual practice, the situation is more complicated than this, because the price of the puts comes into play; but this example shows the general reasoning that the arbitrageur must go through.

Certain arbitrageurs construct positions that allow them to earn interest on a credit balance equal to the striking price of the call. This position involves being short the underlying stock and being long the call. Thus, when the stock goes ex-dividend, the arbitrageur will owe the dividend. If, however, the amount of the dividend is more than he will earn in interest from his credit balance, he will merely exercise his call to cover his short stock. This action will prevent him from having to pay out the dividend.

The arbitrageur's exercise of the call means that someone is going to be assigned. If you are a writer of the call, it could be you. It is not important to understand the arbitrage completely; its effect will be reflected in the marketplace in the form of a call trading at parity or a discount. *Thus, even a LEAPS call with a substantial amount of time remaining may be assigned if it is trading at parity.*

STRADDLE SELLING

Straddle selling is equivalent to ratio writing and is a strategy whereby one attempts to sell (overpriced) options in order to produce a range of stock prices within which the option seller can profit. The strategy often involves follow-up action as the stock moves around, and the strategist feels that he must adjust his position in order to prevent large losses. LEAPS puts and calls might be used for this strategy. However, their long-term nature is often not conducive to the aims of straddle selling.

First, consider the effect of time decay. One might normally sell a three-month straddle. If the stock "behaves" and is relatively unchanged after two months have

passed, the straddle seller could reasonably expect to have a profit of about 40% of the original straddle price. However, if one had sold a 2-year LEAPS straddle, and the stock were relatively unchanged after two months, he would only have a profit of about 7% of the original sale price. This should not be surprising in light of what has been demonstrated about the decaying of long-term options. It should make the straddle seller somewhat leery of using LEAPS, however, unless he truly thinks the options are overpriced.

Second, consider follow-up action. Recall that in Chapter 20, it was shown that the bane of the straddle seller was the whipsaw. A whipsaw occurs when one makes a follow-up protective action on one side (for instance, he does something bullish because the underlying stock is rising and the short calls are losing money), only to have the stock reverse and come crashing back down. Obviously, the more time left until expiration, the more likely it is that a whipsaw will occur after any follow-up action, and the more expensive it will be, since there will be a lot of time value premium left in the options that are being repurchased. This makes LEAPS straddle selling less than attractive.

LEAPS straddles may look expensive because of their large absolute price, and therefore may appear to be attractive straddle sale candidates. However, the price is often justified, and the seller of LEAPS straddles will be fighting sudden stock movements without getting much benefit from the passage of time. The best time to sell LEAPS straddles is when short-term rates are high and volatilities are high as well (i.e., the options are overpriced). At least, in those cases, the seller will derive some real benefit if rates or volatilities should drop.

SPREADS USING LEAPS

Any of the spread strategies previously discussed can be implemented with LEAPS as well, if one desires. The margin requirements are the same for LEAPS spreads as they are for ordinary equity option spreads. One general category of spread lends itself well to using LEAPS: that of buying a longer-term option and selling a short-term one. Calendar spreads, as well as diagonal spreads, fall into that category.

The combinations are myriad, but the reasoning is the same. One wants to own the option that is not so subject to time decay, while simultaneously selling the option that is quite subject to time decay. Of course, since LEAPS are long-term and therefore expensive, one is generally taking on a large debit in such a spread and may have substantial risk if the stock performs adversely. Other risks may be present as well. As a means of demonstrating these facts, let us consider a simple bull spread using calls.

Example: The following prices exist in the month of January:

XYZ: 105
April 100 call: $10^1/_2$
April 110 call: $5^1/_2$
January (2-year) 100 call: 26
January (2-year) 110 call: $21^1/_2$

An investor is considering a bull spread in XYZ and is unsure about whether to use the short-term calls, the LEAPS calls, or a mixture. These are his choices:

Short-term bull spread:	Buy April 100 @ $10^1/_2$
	Sell April 110 @ $5^1/_2$
	Net Debit: $500
Diagonal bull spread:	Buy January LEAPS 100 @ 26
	Sell April 110 @ $5^1/_2$
	Net Debit: $2,050
LEAPS bull spread:	Buy January LEAPS 100 @ 26
	Sell January LEAPS 110 @ $21^1/_2$
	Net Debit: $450

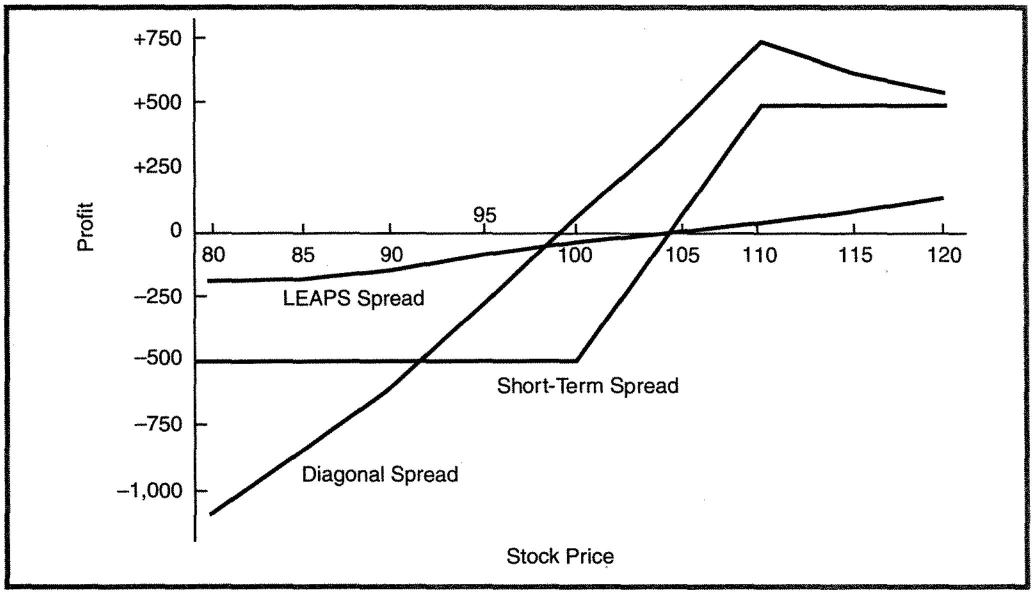
Notice that the debit paid for the LEAPS spread is slightly less than that of the short-term bull spread. This means that they have approximately the same profit potential at their respective expiration dates. However, the strategist is more concerned with how these compare directly with each other. The obvious point in time to make this comparison is when the short-term options expire.

Figure 25-7 shows the profitability of these three positions at April expiration. It was assumed that all of the following were the same in April as they had been in January: volatility, short-term rates, and dividend payout.

Note that the short-term bull spread has the familiar profit graph from Chapter 7, making its maximum profit over 110 and taking its maximum loss below 100. (See Table 25-4.)

The LEAPS spread doesn't generate much of either a profit or a loss in only three months' time. Even if XYZ rises to 120, the LEAPS bull spread will have only a $150 profit. Conversely, if XYZ falls to 80, the spread loses only about $200. This price action is very typical for long-term bull spreads when both options have a significant amount of time premium remaining in them.

FIGURE 25-7.
Bull spread comparison at April expiration.



The diagonal spread is different, however. Typically, the maximum profit potential of a bull spread is the difference in the strikes less the initial debit paid. For this diagonal spread, that would be $1,000 minus $2,050, a loss! Obviously, this simple formula is not applicable to diagonal spreads, because the purchased option still has time value premium when the written option expires. The profit graph shows that indeed the diagonal spread is the most bullish of the three. It makes its best profit at the strike of the written option – a standard procedure for any spread – and that profit is greater than either of the other two spreads *at April expiration* (under the sig-

TABLE 25-4.
Bull spread comparison at April expiration.

Stock Price	Short-Term	Diagonal	LEAPS
80	-500	-1,100	-200
90	-500	- 600	-150
100	-500	50	- 25
110	500	750	50
120	500	550	150
140	500	150	250
160	500	- 50	350
180	500	- 350	450

nificant assumption that volatility and interest rates are unchanged). If XYZ trades higher than 110, the diagonal spread will lose some of its profit; in fact, if XYZ were to trade at a very high price, the diagonal spread would actually have a loss (see Table 25-4). Whenever the purchased LEAPS call loses its time value premium, the diagonal spread will not perform as well.

If the common stock drops in price, the diagonal spread has the greatest risk in dollar terms but not in percentage terms, because it has the largest initial debit. If XYZ falls to 80 in three months, the spread will lose about $1,100, just over half the initial $2,050 debit. Obviously, the short-term spread would have lost 100% of its initial debit, which is only $500, at that same point in time.

The diagonal spread presents an opportunity to earn more money if the underlying common is near the strike of the written option when the written option expires. However, if the common moves a great deal in either direction, the diagonal spread is the worst of the three. This means that the diagonal spread strategy is a neutral strategy: One wants the underlying common to remain near the written strike until the near-term option expires. This is a true statement even if the diagonal spread is under the guise of a bullish spread, as in the previous example.

Many traders are fond of buying LEAPS and selling an out-of-the-money near-term call as a hedge. Be careful about doing this. If the underlying common rises too fast and/or interest rates fall and/or volatility decreases, this could be a poor strategy. There is really nothing quite as psychologically damaging as being right about the stock, but being in the wrong option strategy and therefore losing money. Consider the above examples. Ostensibly, the spreader was bullish on XYZ; that's why he chose bull spreads. If XYZ became a wildly bullish stock and rose from 100 to 180 in three months, the diagonal spreader would have lost money. He couldn't have been happy – no one would be. This is something to keep in mind when diagonalizing a LEAPS spread.

The deltas of the options involved in the spread will give one a good clue as to how it is going to perform. Recall that a short-term, in-the-money option acquires a rather high delta, especially as expiration draws nigh. However, an in-the-money LEAPS call will *not* have an extremely high delta, because of the vast amount of time remaining. Thus, one is short an option with a high delta and long an option with a smaller delta. These deltas indicate that one is going to lose money if the underlying stock rises in price. Consider the following situation:

XYZ Stock, 120:

Call	Position Delta
Long 1 January LEAPS 100 call:	0.70
Short 1 April 110 call:	–0.90

At this point, if XYZ rises in price by 1 point, the spread can be expected to lose 20 cents, since the delta of the short option is 0.20 greater than the delta of the long option.

This phenomenon has ramifications for the diagonal spreader of LEAPS. If the two strike prices of the spread are too close together, it may actually be possible to construct a bull spread that *loses* money on the upside. That would be very difficult for most traders to accept. In the above example, as depicted in Table 25-4, that's what happens. One way around this is to widen the strike prices out so that there is at least *some* profit potential, even if the stock rises dramatically. That may be difficult to do and still be able to sell the short-term option for any meaningful amount of premium.

Note that a diagonal spread could even be considered as a substitute for a covered write in some special cases. It was shown that a LEAPS call can sometimes be used as a substitute for the common stock, with the investor placing the difference between the cost of the LEAPS call and the cost of the stock in the bank (or in T-bills). Suppose that an investor is a covered writer, buying stock and selling relatively short-term calls against it. If that investor were to make a LEAPS call substitution for his stock, he would then have a diagonal bull spread. Such a diagonal spread would probably have less risk than the one described above, since the investor presumably chose the LEAPS substitution because it was "cheap." Still, the potential pitfalls of the diagonal bull spread would apply to this situation as well. Thus, if one is a covered writer, this does not necessarily mean that he can substitute LEAPS calls for the long stock without taking care. The resulting position may not resemble a covered write as much as he thought it would.

The "bottom line" is that if one pays a debit greater than the difference in the strike prices, he may eventually lose money if the stock rises far enough to virtually eliminate the time value premium of both options. This comes into play also if one rolls his options *down* if the underlying stock declines. Eventually, by doing so, he may *invert* the strikes – i.e., the striking price of the written option is lower than the striking price of the option that is owned. In *that* case, he will have locked in a loss if the overall *credit* he has received is less than the difference in the strikes – a quite likely event. So, for those who think this strategy is akin to a guaranteed profit, think again. It most certainly is not.

Backspreads. LEAPS may be applied to other popular forms of diagonal spreads, such as the one in which in-the-money, near-term options are sold, and a greater quantity of longer-term (LEAPS) at- or out-of-the money calls are bought. (This was referred to as a diagonal backspread in Chapter 14.) This is an excellent strategy, and

a LEAPS may be used as the long option in the spread. Recall that the object of the spread is for the stock to be volatile, particularly to the upside if calls are used. If that doesn't happen, and the stock declines instead, at least the premium captured from the in-the-money sale will be a gain to offset against the loss suffered on the longer-term calls that were purchased. The strategy can be established with puts as well, in which case the spreader would want the underlying stock to fall dramatically while the spread was in place.

Without going into as much detail as in the examples above, the diagonal backspreader should realize that he is going to have a significant debit in the spread and could lose a significant portion of it should the underlying stock fall a great deal in price. To the upside, his LEAPS calls will retain some time value premium and will move quite closely with the underlying common stock. Thus, he does not have to buy as many LEAPS as he might think in order to have a neutral spread.

Example: XYZ is at 105 and a spreader wants to establish a backspread. Recall that the quantity of options to use in a neutral strategy is determined by dividing the deltas of the two options. Assume the following prices and deltas exist:

XYZ: 105 in January		
Option	**Price**	**Delta**
April 100 call	8	0.75
July 110 call	5	0.50
January (2-year) LEAPS 100 call	15	0.60

Two backspreads are available with these options. In the first, one would sell the April 100 calls and buy the July 110 calls. He would be selling 3-month calls and buying 6-month calls. The neutral ratio is 0.75/0.50 or 3 to 2; that is, 3 calls are to be bought for every 2 sold. Thus, a neutral spread would be:

Buy 6 July 110 calls
Sell 4 April 100 calls

As a second alternative, he might use the LEAPS as the long side of the spread; he would still sell the April 100 calls as the short side of the spread. In this case, his neutral ratio would be 0.75/0.60, or 5 to 4. The resulting neutral spread would be:

Buy 5 January LEAPS 110 calls
Sell 4 April 100 calls

Thus, a neutral backspread involving LEAPS requires buying fewer calls than a neutral backspread involving a 6-month option on the long side. This is because the delta of the LEAPS call is larger. The significant point here is that, because of the time value retention of the LEAPS call, even when the stock moves higher, it is not necessary to buy as many. If one does not use the deltas, but merely figures that 3 to 2 is a good ratio for any diagonal backspread, then he will be overly bullish if he uses LEAPS. That could cost him if the underlying stock declines.

Calendar Spreads. LEAPS may also be used in calendar spreads – spreads in which the striking price of the longer-term option purchased and the shorter-term option sold are the same. The calendar spread is a neutral strategy, wherein the spreader wants the underlying stock to be as close as possible to the striking price when the near-term option expires. A calendar spread has risk if the stock moves too far away from the striking price (see Chapters 9 and 22). Purchasing a LEAPS call increases that risk in terms of dollars, not percentage, because of the larger debit that one must spend for the spread.

Simplistically, calendar spreads are established with equal quantities of options bought and sold. This is often not a neutral strategy in the true sense. As was shown in Chapter 9 on call calendar spreads, one may want to use the deltas of the two options to establish a truly neutral calendar spread, particularly if the stock is not initially right at the striking price. Out-of-the-money, one would sell more calls than he is buying. Conversely, in-the-money, one would buy more calls than he is selling. Both strategies statistically have merit and are attractive. When using LEAPS deltas to construct the neutral spread, one need generally buy fewer calls than he might think, because of the higher delta of a LEAPS call. This is the same phenomenon described in the previous example of a diagonal backspread.

SUMMARY

LEAPS are nothing more than long-term options. They are usable in a wide variety of strategies in the same way that any option would be. Their margin and investment requirements are similar to those of the more familiar equity options. Both LEAPS puts and calls are traded, and there is a secondary market for them as well.

There are certain differences between the prices of LEAPS and those of shorter-term options, but the greatest is the relatively large effect that interest rates and dividends have on the price of LEAPS, because LEAPS are long-term options. Increases in interest rates will cause LEAPS to increase in price, while increases in dividend payout will cause LEAPS calls to decrease in price and LEAPS puts to

increase in price. As usual, volatility has a major effect on the price of an option, and LEAPS are no exception. Even small changes in the volatility of the underlying common stock can cause large price differences in a two-year option. The rate of decay due to time is much smaller for LEAPS, since they are long-term options. Finally, the deltas of LEAPS calls are larger than those of short-term calls; conversely, the deltas of LEAPS puts are smaller.

Several common strategies lend themselves well to the usage of LEAPS. A LEAPS may be used as a stock substitute if the cash not invested in the stock is instead deposited in a CD or T-bill. LEAPS puts can be bought as protection for common stock. Speculative option buyers will appreciate the low rate of time decay of LEAPS. LEAPS calls can be written against common stock, thereby creating a covered write, although the sale of naked LEAPS puts is probably a better strategy in most cases. Spread strategies with LEAPS may be viable as well, but the spreader should carefully consider the ramifications of buying a long-term option and selling a shorter-term one against it. If the underlying stock moves a great distance quickly, the spread strategy may not perform as expected.

Overall, LEAPS are not very different from the shorter-term options to which traders and investors have become accustomed. Once these investors become familiar with the way these long-term options are affected by the various factors that determine the price of an option, they will consider the use of LEAPS as an integral part of a strategic arsenal.

PART IV

Additional Considerations

CHAPTER 26

Buying Options and Treasury Bills

Numerous strategies have been described, ranging from the simple to the complex. Each one has advantages, but there are disadvantages as well. In fact, some of them may be too complex for the average investor to seriously consider implementing. The reader may feel that there should be an easier answer. Isn't there a strategy that might not require such a large investment or so much time spent in monitoring the position, but would still have a chance of returning a reasonable profit? In fact, there is a strategy that has not yet been described, a strategy considered by some experts in the field of mathematical analysis to be the best of them all. Simply stated, *the strategy consists of putting 90% of one's money in risk-free investments (such as short-term Treasury bills) and buying options with the remaining 10% of one's funds.*

It has previously been pointed out that some of the more attractive strategies are those that involve small levels of risk with the potential for large profits. Usually, these types of strategies inherently have a rather large frequency of small losses, and a small probability of realizing large gains. Their advantage lies in the fact that one or two large profits can conceivably more than make up for numerous small losses. This Treasury bill/option strategy is another strategy of this type.

HOW THE TREASURY BILL/OPTION STRATEGY OPERATES

Although there are certain details involved in operating this strategy, it is basically a simple one to approach. First, the most that one can lose is 10%, less the interest earned on the fixed-income portion of his portfolio (the remaining 90% of his assets), during the life of the purchased options. It is a simple matter to space out one's com-

mitments to option purchases so that his overall risk in a one-year period can be kept down to nearly 10%.

Example: An investor might decide to put 2½% of his money into three-month option purchases. Thus, in any one year, he would be risking 10%. At the same time he would be earning perhaps 6% from the overall interest generated on the fixed-income securities that make up the remaining 90% of his assets. This would keep his overall risk down to approximately 4.6% per year.

There are better ways to monitor this risk, and they are described shortly. The potential profits from this strategy are limited only by time. Since one is owning options – say call options – he could profit handsomely from a large upward move in the stock market. As with any strategy in which one has limited risk and the potential of large profits, a small number of large profits could offset a large number of small losses. In actual practice, of course, his profits will never be overwhelming, since only approximately 10% of the money is committed to option purchases.

In total, *this strategy has greatly reduced risk with the potential of making above-average profits.* Since the 10% of the money that is invested in options gives great leverage, it might be possible for that portion to double or triple in a short time under favorable market conditions. This strategy is something like owning a convertible bond. A convertible bond, since it is convertible into the common stock, moves up and down in price with the price of the underlying stock. However, if the stock should fall a great deal, the bond will not follow it all the way down, because eventually its yield will provide a "floor" for the price.

A strategy that is not used very often is called the "synthetic convertible bond." One buys a debenture and a call option on the same stock. If the stock rises in price, the call does too, and so the combination of the debenture and the call acts much like a convertible bond would to the upside. If, on the other hand, the stock falls, the call will expire worthless; but the investor will retain most of his investment, because he will still have the debenture plus any interest that the bond has paid.

The strategy of placing 90% of one's money into risk-free, interest-bearing certificates and buying options with the remainder is superior to the convertible bond or the "synthetic convertible bond," since there is no risk of price fluctuation in the largest portion of the investment.

The Treasury bill/option strategy is fairly easy to operate, although one does have to do some work every time new options are purchased. Also, periodic adjustments need to be made to keep the level of risk approximately the same at all times. As for which options to buy, the reader may recall that specifications were outlined in Chapters 3 and 16 on how to select the best option purchases. These criteria can be summarized briefly as follows:

1. Assume that each underlying stock can advance or decline in accordance with its volatility over a fixed time period (30, 60, or 90 days).
2. Estimate the call prices after the advance, or put prices after the decline.
3. Rank all potential purchases by the highest reward opportunity.

The user of this strategy need only be interested in those option purchases that provide the highest reward opportunity under this ranking method. In the previous chapters on option buying, it was mentioned that one might want to look at the risk/reward ratios of his potential option purchases in order to have a more conservative list. However, that is not necessary in the Treasury bill/option strategy, since the overall risk has already been limited. A ranking of option purchases via the foregoing criteria will generally give a list of at- or slightly out-of-the-money options. These are not necessarily "underpriced" options; although if an option is truly underpriced, it will have a better chance of ranking higher on the selection list than one that is "overpriced."

A list of potential option purchases that is constructed with criteria similar to those outlined above is available from many data services and brokerage firms. The strategist who is willing to select his option purchases in this manner will find that he does not have to spend a great deal of time on the selection process. The reader should note that *this type of option purchase ranking completely ignores the outlook for the underlying stock.* If one would rather make his purchases based on an outlook for the underlying stock – preferably a technical outlook – he will be forced to spend more time on his selection process. Although this may be appealing to some investors, it will probably yield worse results in the long run than the previously described unbiased approach to option purchases, unless the strategist is extremely adept at stock selection.

KEEPING THE RISK LEVEL EQUAL

The second function that the strategist has to perform in this Treasury bill/option strategy is to keep his risk level approximately equal at all times.

Example: An investor starts the strategy with $90,000 in Treasury bills (T-bills) and $10,000 in option purchases. After some time has passed, the option purchases may have worked out well and perhaps he now has $90,000 in T-bills plus $30,000 worth of options, plus interest from the T-bills. Obviously, he no longer has 90% of his money in fixed-income securities and 10% in option purchases. The ratio is now 75% in T-bills and 25% in option purchases. This is too risky a ratio, and the strategist must consequently sell some of his options and buy T-bills with the proceeds. Since his total assets are $120,000 currently, he must sell out $18,000 of options to bring his

option investment down from the current $30,000 figure to $12,000, or 10% of his total assets. If one fails to adhere to this readjustment of his funds after profits are made, he may eventually lose those profits. Since options can lose a great percentage of their worth in a short time period, the investor is always running the risk that the option portion of his investment may be nearly wiped out. If he has kept all his profits in the option portion of his strategy, he is constantly risking nearly all of his accumulated profits, and that is not wise.

One must also adjust his ratio of T-bills to options after losses occur.

Example: In the first year, the strategist loses all of the $10,000 he originally placed in options. This would leave him with total assets of $90,000 plus interest (possibly $6,000 of interest might be earned). He could readjust to a 90:10 ratio by selling out some of the T-bills and using the proceeds to buy options. If one follows this strategy, he will be risking 10% of his funds each year. Thus, a series of loss years could depreciate the initial assets, although the net losses in one year would be smaller than 10% because of the interest earned on the T-bills. It is recommended that the strategist pursue this method of readjusting his ratios in both up and down markets in order to constantly provide himself with essentially similar risk/reward opportunities at all times.

The individual can blend the option selection process and the adjustment of the T-bill/option ratio to fit his individual portfolio. The larger portfolio can be diversified into options with differing holding periods, and the ratio adjustments can be made quite frequently, perhaps once a month. The smaller investor should concentrate on somewhat longer holding periods for his options, and would adjust the ratio less often. Some examples might help to illustrate the way in which both the large and small strategist might operate. It should be noted that this T-bill/option strategy is quite adaptable to fairly small sums of money, as long as the 10% that is going to be put into option purchases allows one to be able to participate in a reasonable manner. A tactic for the extremely small investor is also described below.

ANNUALIZED RISK

Before getting into portfolio size, let us describe the concept of annualized risk. One might want to purchase options with the intent of holding some of them for 30 days, some for 90 days, and some for 180 days. Recall that he does not want his option purchases to represent more than 10% annual risk at any time. In actual practice, if one purchases an option that has 90 days of life, but he is planning to hold the option only 30 days, he will most likely not lose 100% of his investment in

the 30-day period. However, for purposes of computing annualized risk easily, the assumption that will be made is that the risk during any *holding period* is 100%, regardless of the length of time remaining in the life of the option. Thus, a 30-day option purchase represents an annualized risk of 1,200% (100% risk every 30 days times twelve 30-day periods in one year). Ninety-day purchases have 400% annualized risk, and 180-day purchases have 200% annualized risk. There is a multitude of ways to combine purchases in these three holding periods so that the overall risk is 10% annualized.

Example: An investor could put 2½% of his total money into 90-day purchases four times a year. That is, 2½% of his total assets are being subjected to a 400% annualized risk; 400% times 2½% equals 10% annualized risk on the total assets. Of course, the remainder of the assets would be placed in risk-free, income-bearing securities. Another of the many combinations might be to place 1% of the total assets in 90-day purchases and also place 3% of the total assets in 180-day purchases. Thus, 1% of one's total money would be subjected to a 400% annual risk and 3% would be subjected to a 200% annual risk (.01 times 400 plus .03 times 200 equals 10% annualized risk on the entire assets). If one prefers a formula, annualized risk can be computed as:

$$\text{Annualized risk on entire portfolio} = \frac{\text{Percent of total}}{\text{assets invested}} \times \frac{360}{\text{Holding period}}$$

If one is able to diversify into several holding periods, the annualized risk is merely the sum of the risks for each holding period.

With this information in mind, the strategist can utilize option purchases of 1 month, 3 months, and 6 months, preferably each generated by a separate computer analysis similar to the one described earlier. He will know how much of his total assets he can place into purchases of each holding period, because he will know his annualized risk.

Example: Suppose that a very large investor, or pool of investors, has $1 million committed to this T-bill/option strategy. Further, suppose ½ of 1% of the money is to be committed to 30-day option purchases with the idea of reinvesting every 30 days. Similarly, ½ of 1% is to be placed in 90-day purchases and 1% in 180-day purchases. The annualized risk is 10%:

$$\begin{aligned}\text{Total annualized risk} &= \tfrac{1}{2}\% \times \frac{360}{30} + \tfrac{1}{2}\% \times \frac{360}{90} + 1\% \times \frac{360}{180} \\ &= .06 \qquad + \quad .02 \qquad + \qquad .02 = 10\%\end{aligned}$$

With assets of $1 million, this means that $5,000 would be committed to 30-day purchases; $5,000 to 90-day purchases; and $10,000 to 180-day purchases. This money would be reinvested in similar quantities at the end of each holding period.

RISK ADJUSTMENT

The subject of adjusting the ratio to constantly reflect 10% risk must be addressed at the end of each holding period. Although it is correct for the investor to keep his percentage commitments constant, he must not be deluded into automatically reinvesting the same amount of dollars each time.

Example: At the end of 30 days, the value of the entire portfolio, including potential option profits and losses, and interest earned, was down to $990,000. Then only ½ of 1% of *that* amount should be invested in the next 30-day purchase ($4,950).

By operating in this manner – first computing the annualized risk and balancing it through predetermined percentage commitments to holding periods of various lengths; and second, readjusting the actual dollar commitment at the end of each holding period – the overall risk/reward ratios will be kept close to the levels described in the earlier, simple description of this strategy. This may require a relatively large amount of work on the part of the strategist, but large portfolios usually do require work.

The smaller investor does not have the luxury of such complete diversification, but he also does not have to adjust his total position as often.

Example: An investor decided to commit $50,000 to this strategy. Since there is a 1,200% annualized risk in 30-day purchases, it does not make much sense to even consider purchases that are so short-term for assets of this size. Rather, he might decide to commit 1% of his assets to a 90-day purchase and 3% to a 180-day purchase. In dollar amounts, this would be $500 in a 90-day option and $1,500 in 180-day options. Admittedly, this does not leave much room for diversification, but to risk more in the short-term purchases would expose the investor to too much risk. In actual practice, this investor would probably just invest 5% of his assets in 180-day purchases, also a 10% annualized risk. This would mean that he could operate with only one option buyer's analysis (the 180-day one) and could place $2,500 into selections from that list.

His adjustments of the assets committed to option purchases could not be done as frequently as the large investor, because of the commissions involved. He certainly would have to adjust every 180 days, but might prefer to do so more frequently – perhaps every 90 days – to be able to space his 180-day commitments over different

option expiration cycles. It should also be pointed out that T-bills can be bought and sold only in amounts of at least \$10,000 and in increments of \$5,000 thereafter. That is, one could buy or sell \$10,000 or \$15,000 or \$20,000 or \$25,000, and so on, but could not buy or sell \$5,000 or \$8,000 or \$23,000 in T-bills. This is of little concern to the investor with \$1 million, since it takes only a fraction of a percentage of his assets to be able to round up to the next \$5,000 increment for a T-bill sale or purchase. However, the medium-sized investor with a \$50,000 portfolio might run into problems. While short-term T-bills do represent the best risk-free investment, the medium-sized investor might want to utilize one of the no-load, money market funds for at least part of his income-bearing assets. Such funds have only slightly more risk than T-bills and offer the ability to deposit and withdraw in any amount.

The truly small investor might be feeling somewhat left out. Could it be possible to operate this strategy with a very small amount of money, such as \$5,000? Yes it could, but there are several disadvantages.

Example: It would be extremely difficult to keep the risk level down to 10% annually with only \$5,000. For example, 5% of the money invested every 180 days is only \$250 in each investment period. Since the option selection process that is described will tend to select at- or slightly out-of-the-money calls, many of these will cost more than 2½ points for one option. The small investor might decide to raise his risk level slightly, although the risk level should never exceed 20% annually, no matter how small the actual dollar investment. To exceed this risk level would be to completely defeat the purpose of the fixed-income/option purchase strategy. Obviously, this small investor cannot buy T-bills, for his total investable assets are below the minimum \$10,000 purchase level. He might consider utilizing one of the money market funds. Clearly, an investor of this small magnitude is operating at a double disadvantage: His small dollar commitment to option purchases may preclude him from buying some of the more attractive items; and his fixed-income portion will be earning a smaller percentage interest rate than that of the larger investor who is in T-bills or some other form of relatively risk-free, income-bearing security. Consequently, *the small investor should carefully consider his financial capability and willingness to adhere strictly to the criteria of this strategy before actually committing his dollars.*

It may appear to the reader that the actual dollars being placed at risk in each option purchase are quite small in these examples. In fact, they are rather small, but they have been shown to represent 10% annualized risk. An assumption was made in these examples that the risk in each option purchase was 100% for the holding period. This is a fairly restrictive assumption and, if it were lessened, would allow for a larger dollar commitment in each holding period. It is difficult and dangerous, how-

ever, to assume that the risk in holding a call option is less than 100% in a holding period as short as 30 days. The strategist may feel that he is disciplined enough to sell out when losses occur and thereby hold the risk to less than 100%. Alternatively, mathematical analysis will generally show that the expected loss in a fixed time period is less than 100%. One can also mitigate the probability of losing all of his money in an option purchase by buying in-the-money options. While they are more expensive, of course, they do have a larger probability of having some residual worth even if the underlying stock doesn't rise to the trader's expectations. Adhering to any of these criteria can lead one to become too aggressive and therefore be too heavily committed to option purchases. It is far safer to stick to the simpler, more restrictive assumption that one is risking all his money, even over a fairly short holding period, when he buys an option.

AVOIDING EXCESSIVE RISK

One final word of caution must be inserted. *The investor should not attempt to become "fancy" with the income-bearing portion of his assets.* T-bills may appear to be too "tame" to some investors, and they consider using GNMA's (Government National Mortgage Association certificates), corporate bonds, convertible bonds, or municipal bonds for the fixed-income portion. Although the latter securities may yield a slightly higher return than do T-bills, they may also prove to be less liquid and they quite clearly involve more risk than a short-term T-bill does. Moreover, some investors might even consider placing the balance of their funds in other places, such as high-yield stock or covered call writing. While high-yield stock purchases and covered call writing are conservative investments, as most investments go, they would have to be considered very speculative in comparison to the purchase of a 90-day T-bill. In this strategy, the profit potential is represented by the option purchases. The yield on short-term T-bills will quite adequately offset the risks. One should take great care not to attempt to generate much higher yields on the fixed-income portion of his investment, for he may find that he has assumed risk with the portion of his money that was not intended to have any risk at all.

A fair amount of rigorous mathematical work has been done on the evaluation of this strategy. *The theoretical papers are quite favorable.* Scholars have generally considered only the purchase of call options as the risk portion of the strategy. Obviously, the strategist is quite free to purchase put options without harming the overall intent of the strategy. When only call options are purchased, both static and down markets harm the performance. If some puts are included in the option purchases, only static markets could produce the worst results.

There are trade-offs involved as well. If, after purchasing the options, the market experiences a substantial rally, that portion of the option purchase money that is devoted to put option purchases will be lost. Thus, the combination of both put and call purchases would do better in a down market than a strategy of buying only calls, but would do worse in an up market. In a broad sense, it makes sense to include some put purchases if one has the funds to diversify, since the frequency of market rallies is smaller than the combined frequency of market rallies and declines. The investor who owns both puts and calls will be able to profit from substantial moves in either direction, because the profitable options will be able to overcome the limited losses on the unprofitable ones.

SUMMARY

In summary, the T-bill/option strategy is attractive from several viewpoints. *Its true advantage lies in the fact that it has predefined risk and does not have a limit on potential profits.* Some theorists claim it is the best strategy available, if the options are "underpriced" when they are purchased. The strategy is also relatively simple to operate. It is not necessary to have a margin account or to compute collateral requirements for uncovered options; the strategy can be operated completely from a cash account. There are no spreads involved, nor is it necessary to worry about details such as early assignment (because there are no short options in this strategy).

The investor who is going to employ this strategy, however, must not be deluded into thinking that it is so simple that it does not take any work at all. The concepts and application of annualized risk management are very important to the strategy. So are the mechanics of option buying – particularly a disciplined, rational approach to the selection of which calls and/or puts to buy. Consequently, this strategy is suitable only for the investor who has both the time and the discipline to operate it correctly.

CHAPTER 27

Arbitrage

Arbitrage in the securities market often connotes that one is buying something in one marketplace and selling it in another marketplace, for a small profit with little or no risk. For example, one might buy XYZ at 55 in New York and sell it at 55¼ in Chicago. Arbitrage, especially option arbitrage, involves a far wider range of tactics than this simple example. Many of the option arbitrage tactics involve buying one side of an equivalent position and simultaneously selling the other side. Since there is a large number of equivalent strategies, many of which have been pointed out in earlier chapters, a full-time option arbitrageur is able to construct a rather large number of positions, most of which have little or no risk. The public customer cannot generally operate arbitrage-like strategies because of the commission costs involved. Arbitrageurs are firm traders or floor traders who are trading through a seat on the appropriate securities exchange, and therefore have only minimal transaction costs.

The public customer can benefit from understanding arbitrage techniques, even if he does not personally employ them. The arbitrageurs perform a useful function in the option marketplace, often making markets where a market might not otherwise exist (deeply in-the-money options, for example). This chapter is directed at the strategist who is actually going to be participating in arbitrage. This should not be confusing to the public customer, for he will better understand the arbitrage strategies if he temporarily places himself in the arbitrageur's shoes.

It is virtually impossible to perform pure arbitrage on dually listed options; that is, to buy an option on the CBOE and sell it on the American exchange in New York for a profit. Such discrepancies occur so infrequently and in such small size that an option arbitrageur could never hope to be fully employed in this type of simple arbitrage. Rather, the more complex forms of arbitrage described here are the ones on which he would normally concentrate.

BASIC PUT AND CALL ARBITRAGE ("DISCOUNTING")

The basic call and the basic put arbitrages are two of the simpler forms of option arbitrage. In these situations, *the arbitrageur attempts to buy the option at a discount while simultaneously taking an opposite position in the underlying stock.* He can then exercise his option immediately and make a profit equal to the amount of the discount.

The basic call arbitrage is described first. This was also outlined in Chapter 1, under the section on anticipating exercise.

Example: XYZ is trading at 58 and the XYZ July 50 call is trading at 7¾. The call is actually at a discount from parity of ¼ point. Discount options generally either are quite deeply in-the-money or have only a short time remaining until expiration, or both. The call arbitrage would be constructed by:

1. buying the call at 7¾;
2. selling the stock at 58;
3. exercising the call to buy the stock at 50.

The arbitrageur would make 8 points of profit from the stock, having sold it at 58 and bought it back at 50 via the option exercise. He loses the 7¾ points that he paid for the call option, but this still leaves him with an overall profit of ¼ point. Since he is a member of the exchange, or is trading the seat of an exchange member, the arbitrageur pays only a small charge to transact the trades.

In reality, the stock is not sold *short* per se, even though it is sold before it is bought. Rather, the position is designated, at the time of its inception, as an "irrevocable exercise." The arbitrageur is promising to exercise the call. As a result, no uptick is required to sell the stock.

The main goal in the call arbitrage is to be able to buy the call at a discount from the price at which the stock is sold. The differential is the profit potential of the arbitrage. *The basic put arbitrage is quite similar* to the call arbitrage. Again, the arbitrageur is looking to buy the put option at a discount from parity. The put arbitrage is completed with a stock purchase and option exercise.

Example: XYZ is at 58 and the XYZ July 70 put is at 11¾. With the put at ¼ discount from parity, the arbitrageur might take the following action:

1. Buy put at 11¾.
2. Buy stock at 58.
3. Exercise put to sell stock at 70.

The stock transaction is a 12-point profit, since the stock was bought at 58 and is sold at 70 via the put exercise. The cost of the put – $11^3/_4$ points – is lost, but the arbitrageur still makes $^1/_4$-point profit. Again, *this profit is equal to the amount of the discount in the option when the position was established.* Generally, the arbitrageur would exercise his put option immediately, because he would not want to tie up his capital to carry the long stock. An exception to this would be if the stock were about to go ex-dividend. Dividend arbitrage is discussed in the next section.

The basic call and put arbitrages may exist at any time, although they will be more frequent when there is an abundance of deeply in-the-money options or when there is a very short time remaining until expiration. After market rallies, the call arbitrage may be easier to establish; after market declines, the put arbitrage will be easier to find. As an expiration date draws near, an option that is even slightly in-the-money on the last day or two of trading could be a candidate for discount arbitrage. The reason that this is true is that public buying interest in the option will normally wane. The only public buyers would be those who are short and want to cover. Many covered writers will elect to let the stock be called away, so that will reduce even further the buying potential of the public. This leaves it to the arbitrageurs to supply the buying interest.

The arbitrageur obviously wants to establish these positions in as large a size as possible, since there is no risk in the position if it is established at a discount. Usually, there will be a larger market for the stock than there will be for the options, so the arbitrageur spends more of his time on the option position. However, there may be occasions when the option markets are larger than the corresponding stock quotes. When this happens, the arbitrageur has an alternative available to him: *He might sell an in-the-money option at parity rather than take a stock position.*

Example: XYZ is at 58 and the XYZ July 50 call is at $7^3/_4$. These are the same figures as in the previous example. Furthermore, suppose that the trader is able to buy more options at $7^3/_4$ than he is able to sell stock at 58. If there were another in-the-money call that could be sold at parity, it could be used in place of the stock sale. For example, if the XYZ July 40 call could be sold at 18 (parity), the arbitrage could still be established. If he is assigned on the July 40 that he is short, he will then be short stock at a net price of 58 – the striking price of 40, plus the 18 points that were brought in from the sale of the July 40 call. Thus, *the sale of the in-the-money call at parity is equivalent to shorting the stock for the arbitrage purpose.*

In a similar manner, an in-the-money put can be used in the basic put arbitrage.

Example: With XYZ at 58 and the July 70 put at $11^3/_4$, the arbitrage could be established. However, if the trader is having trouble buying enough stock at 58, he might

be able to use another in-the-money put. Suppose the XYZ July 80 put could be sold at 22. This would be the same as buying the stock at 58, because if the put were assigned, the arbitrageur would be forced to buy stock at 80 – the striking price – but his net cost would be 80 minus the 22 points he received from the sale of the put, for a net cost of 58. Again, the arbitrageur is able to use the sale of a deeply in-the-money option as a substitute for the stock trade.

The examples above assumed that the arbitrageur sold a deeper in-the-money option at parity. In actual practice, if an in-the-money option is at a discount, an even deeper in-the-money option will generally be at a discount as well. The arbitrageur would normally try to sell, at parity, an option that was less deeply in-the-money than the one he is discounting.

In a broader sense, this technique is applicable to any arbitrage that involves a stock trade as part of the arbitrage, except when the dividend in the stock itself is important. *Thus, if the arbitrageur is having trouble buying or selling stock as part of his arbitrage, he can always check whether there is an in-the-money option that could be sold to produce a position equivalent to the stock position.*

DIVIDEND ARBITRAGE

Dividend arbitrage is actually quite similar to the basic put arbitrage. The trader can lock in profits by buying both the stock and the put, then waiting to collect the dividend on the underlying stock before exercising his put. *In theory, on the day before a stock goes ex-dividend, all puts should have a time value premium at least as large as the dividend amount.* This is true even for deeply in-the-money puts.

Example: XYZ closes at 45 and is going to go ex-dividend by \$1 tomorrow. Then a put with striking price of 50 should sell for at least 6 points (the in-the-money amount plus the amount of the dividend), because the stock will go ex-dividend and is expected to open at 44, six points in-the-money.

If, however, the put's time value premium should be less than the amount of the dividend, the arbitrageur can take a riskless position. Suppose the XYZ July 50 put is selling for 5¾, with the stock at 45 and about to go ex-dividend by \$1. The arbitrageur can take the following steps:

1. Buy the put at 5¾.
2. Buy the stock at 45.
3. Hold the put and stock until the stock goes ex-dividend (1 point in this case).
4. Exercise the put to sell the stock at 50.

The trader makes 5 points from the stock trade, buying it at 45 and selling it at 50 via the put exercise, and also collects the 1-point dividend, for a total inflow of 6 points. Since he loses the 5¾ points he paid for the put, his net profit is ¼ point.

Far in advance of the ex-dividend date, a deeply in-the-money put may trade very close to parity. Thus, it would seem that the arbitrageur could "load up" on these types of positions and merely sit back and wait for the stock to go ex-dividend. There is a flaw in this line of thinking, however, because *the arbitrageur has a carrying cost for the money that he must tie up in the long stock.* This carrying cost fluctuates with short-term interest rates.

Example: If the current rate of carrying charges were 6% annually, this would be equivalent to 1% every 2 months. If the arbitrageur were to establish this example position 2 months prior to expiration, he would have a carrying cost of .5075 point. (His total outlay is 50¾ points, 45 for the stock and 5¾ for the options, and he would pay 1% to carry that stock and option for the two months until the ex-dividend date.) This is more than ½ point in costs – clearly more than the ¼-point potential profit. Consequently, the arbitrageur must be aware of his carrying costs if he attempts to establish a dividend arbitrage well in advance of the ex-dividend date. Of course, if the ex-dividend date is only a short time away, the carrying cost has little effect, and the arbitrageur can gauge the profitability of his position mostly by the amount of the dividend and the time value premium in the put option.

The arbitrageur should note that this strategy of buying the put and buying the stock to pick up the dividend might have a residual, rather profitable side effect. If the underlying stock should rally up to or above the striking price of the put, there could be rather large profits in this position. Although it is not likely that such a rally could occur, it would be an added benefit if it did. Even a rather small rally might cause the put to pick up some time premium, allowing the arbitrageur to trade out his position for a profit larger than he could have made by the arbitrage discount.

This form of arbitrage occasionally lends itself to a limited form of risk arbitrage. Risk arbitrage is a strategy that is designed to lock in a profit if a certain event occurs. If that event does not occur, there could be a loss (usually quite limited); hence, the position has risk. *This risk element differentiates a risk arbitrage from a standard, no-risk arbitrage.* Risk arbitrage is described more fully in a later section, but the following example concerning a special dividend is one form of risk arbitrage.

Example: XYZ has been known to declare extra, or special, dividends with a fair amount of regularity. There are several stocks that do so – Eastman Kodak and General Motors, for example. In this case, assume that a hypothetical stock, XYZ, has

generally declared a special dividend in the fourth quarter of each year, but that its normal quarterly rate is \$1.00 per share. Suppose the special dividend in the fourth quarter has ranged from an extra \$1.00 to \$3.00 over the past five years. If the arbitrageur were willing to speculate on the size of the upcoming dividend, he might be able to make a nice profit. Even if he overestimates the size of the special dividend, he has a limited loss. Suppose XYZ is trading at 55 about two weeks before the company is going to announce the dividend for the fourth quarter. There is no guarantee that there will, in fact, be a special dividend, but assume that XYZ is having a relatively good year profitwise, and that some special dividend seems forthcoming. Furthermore, suppose the January 60 put is trading at 7½. This put has 2½ points of time value premium. If the arbitrageur buys XYZ at 55 and also buys the January 60 put at 7½, he is setting up a risk arbitrage. He will profit regardless of how far the stock falls or how much time value premium the put loses, if the special dividend is larger than \$1.50. A special dividend of \$1.50 plus the regular dividend of \$1.00 would add up to \$2.50, or 2½ points, thus covering his risk in the position. Note that \$1.50 is in the low end of the \$1.00 to \$3.00 recent historical range for the special dividends, so the arbitrageur might be tempted to speculate a little by establishing this dividend risk arbitrage. Even if the company unexpectedly decided to declare no special dividend at all, it would most likely still pay out the \$1.00 regular dividend. Thus, the most that the arbitrageur would lose would be 1½ points (his 2½-point initial time value premium cost, less the 1-point dividend). In actual practice, the stock would probably not change in price by a great deal over the next two weeks (it is a high-yield stock), and therefore the January 60 put would probably have some time value premium left in it after the stock goes ex-dividend. Thus, the practical risk is even less than 1½ points.

While these types of dividend risk arbitrage are not frequently available, the arbitrageur who is willing to do some homework and also take some risk may find that he is able to put on a position with a small risk and a profitability quite a bit larger than the normal discount dividend arbitrage.

There is really not a direct form of dividend arbitrage involving call options. If a relatively high-yield stock is about to go ex-dividend, holders of the calls will attempt to sell. They do so because the stock will drop in price, thereby generally forcing the call to drop in price as well, because of the dividend. However, the holder of a call does not receive cash dividends and therefore is not willing to hold the call if the stock is going to drop by a relatively large amount (perhaps ¾ point or more). The effect of these call holders attempting to sell their calls may often produce a discount option, and therefore a basic call arbitrage may be possible. The arbitrageur should be careful, however, if he is attempting to arbitrage a stock that is

going ex-dividend on the following day. Since he must sell the stock to set up the arbitrage, he cannot afford to wind up the day being short any stock, for he will then have to pay out the dividend the following day (the ex-dividend date). Furthermore, his records must be accurate, so that he exercises all his long options on the day before the ex-dividend date. If the arbitrageur is careless and is still short some stock on the ex-date, he may find that the dividend he has to pay out wipes out a large portion of the discount profits he has established.

CONVERSIONS AND REVERSALS

In the introductory material on puts, it was shown that put and call prices are related through a process known as conversion. This is an arbitrage process whereby a trader may sometimes be able to lock in a profit at absolutely no risk. *A conversion consists of buying the underlying stock, and also buying a put option and selling a call option such that both options have the same terms. This position will have a locked-in profit if the total cost of the position is less than the striking price of the options.*

Example: The following prices exist:

XYZ common, 55;

XYZ January 50 call, 6½; and

XYZ January 50 put, 1.

The total cost of this conversion is 49½ – 55 for the stock, plus 1 for the put, less 6½ for the call. Since 49½ is less than the striking price of 50, there is a locked-in profit on this position. To see that such a profit exists, suppose the stock is somewhere above 50 at expiration. It makes no difference how far above 50 the stock might be; the result will be the same. With the stock above 50, the call will be assigned and the stock will be sold at a price of 50. The put will expire worthless. Thus, the profit is ½ point, since the initial cost of the position was 49½ and it can eventually be liquidated for a price of 50 at expiration. A similar result occurs if XYZ is below 50 at expiration. In this case, the trader would exercise his put to sell his stock at 50, and the call would expire worthless. Again, the position is liquidated for a price of 50 and, since it only cost 49½ to establish, the same ½-point profit can be made. No matter where the stock is at expiration, this position has a locked-in-profit of ½ point.

This example is rather simplistic because it does not include two very important factors: the possible dividend paid by the stock and the cost of carrying the position

until expiration. The inclusion of these factors complicates things somewhat, and its discussion is deferred momentarily while the companion strategy, the reversal, is explained.

A reversal (or reverse conversion, as it is sometimes called) is exactly the opposite of a conversion. *In a reversal, the trader sells stock short, sells a put, and buys a call.* Again, the put and call have the same terms. *A reversal will be profitable if the initial credit (sale price) is greater than the striking price of the options.*

Example: A different set of prices will be used to describe a reversal:

XYZ common, 55;

XYZ January 60 call, 2; and

XYZ January 60 put, $7\frac{1}{2}$.

The total credit of the reversal is $60\frac{1}{2} - 55$ from the stock sale, plus $7\frac{1}{2}$ from the put sale, less the 2-point cost of the call. Since $60\frac{1}{2}$ is greater than the striking price of the options, 60, there is a locked-in profit equal to the differential of $\frac{1}{2}$ point. To verify this, first assume that XYZ is anywhere below 60 at January expiration. The put will be assigned – stock is bought at 60 – and the call will expire worthless. Thus, the reversal position is liquidated for a cost of 60. A $\frac{1}{2}$-point profit results since the original sale value (credit) of the position was $60\frac{1}{2}$. On the other hand, if XYZ were above 60 at expiration, the trader would exercise his call, thus buying stock at 60, and the put would expire worthless. Again, he would liquidate the position at a cost of 60 and would make a $\frac{1}{2}$-point profit.

Dividends and carrying costs are important in reversals, too; these factors are addressed here. The conversion involves buying stock, and the trader will thus receive any dividends paid by the stock during the life of the arbitrage. However, the converter also has to pay out a rather large sum of money to set up his arbitrage, and must therefore deduct the cost of carrying the position from his potential profits. In the example above, the conversion position cost $49\frac{1}{2}$ points to establish. If the trader's cost of money were 6% annually, he would thus lose $.06/12 \times 49\frac{1}{2}$, or .2475 point per month for each month that he holds the position. This is nearly $\frac{1}{4}$ of a point per month. Recall that the potential profit in the example is $\frac{1}{2}$ point, so that if one held the position for more than two months, his carrying costs would wipe out his profit. *It is extremely important that the arbitrageur compute his carrying costs accurately prior to establishing any conversion arbitrage.*

If one prefers formulae, the profit potentials of a conversion or a reversal can be stated as:

$$\text{Conversion profit} = \text{Striking price} + \text{Call price} - \text{Stock price} - \text{Put price} + \text{Dividends to be received} - \text{Carrying cost of position}$$

$$\text{Reversal profit} = \text{Stock} + \text{Put} - \text{Strike} - \text{Call} + \text{Carrying cost} - \text{Dividends}$$

Note that during any one trading day, the only items in the formulae that can change are the prices of the securities involved. The other items, dividends and carrying cost, are fixed for the day. Thus, one could have a small computer program prepared that listed the fixed charges on a particular stock for all the strikes on that stock.

Example: It is assumed that XYZ stock is going to pay a ½-point dividend during the life of the position, and that the position will have to be held for three months at a carrying cost of 6% per year. If the arbitrageur were interested in a conversion with a striking price of 50, his fixed cost would be:

$$\begin{aligned}\text{Conversion fixed cost} &= \text{Carrying rate} \times \text{Time held} \times \text{Striking price} - \text{Dividend to be received} \\ &= .06 \times 3/12 \times 50 - 1/2 \\ &= .75 - 1/2 = .25, \text{ or } 1/4 \text{ point}\end{aligned}$$

The arbitrageur would know that if the profit potential, computed in the simplistic manner using only the prices of the securities involved, was greater than ¼ point, he could establish the conversion for an eventual profit, including all costs. Of course, the carrying costs would be different if the striking price were 40 or 60, so a computer printout of all the possible striking prices on each stock would be useful in order for the trader to be able to refer quickly to a table of his fixed costs each day.

MORE ON CARRYING COSTS

The computation of carrying costs can be made more involved than the simple method used above. Simplistically, the carrying cost is computed by multiplying the debit of the position by the interest rate charged and the time that the position will be held. That is, it could be formulated as:

$$\text{Carrying cost} = \text{Strike} \times r \times t$$

where r is the interest rate and t is the time that the position will be held. Relating this formula for the carrying cost to the conversion profit formula given above, one would get:

$$\begin{aligned}\text{Conversion profit} &= \text{Call} - \text{Stock} - \text{Put} + \text{Dividend} + \text{Strike} - \text{Carrying cost} \\ &= \text{Call} - \text{Stock} - \text{Put} + \text{Dividend} + \text{Strike}\ (1 - rt)\end{aligned}$$

In an actuarial sense, the carrying cost could be expressed in a slightly more complex manner. The simple formula (strike $\times$ r $\times$ t) ignores two things: the compounding effect of interest rates and the "present value" concept (the present value of a future amount). The absolutely correct formula to include both present value and the compounding effect would necessitate replacing the factor strike $(1 - rt)$ in the profit formula by the factor

$$\frac{\text{Strike}}{(1 + r)^t}$$

Is this effect large? No, not when r and t are small, as they would be for most option calculations. The interest rate per month would normally be less than 1%, and the time would be less than 9 months. Thus, it is generally acceptable, and is the common practice among many arbitrageurs, to use the simple formula for carrying costs. In fact, this is often a matter of convenience for the arbitrageur if he is computing the carrying costs on a hand calculator that does not perform exponentiation. However, in periods of high interest rates when longer-term options are being analyzed, the arbitrageur who is using the simple formula should double-check his calculations with the correct formula to assure that his error is not too large.

For purposes of simplicity, the remaining examples use the simple formula for carrying-cost computations. The reader should remember, however, that it is only a convenient approximation that works best when the interest rate and the holding period are small. This discussion of the compounding effect of interest rates also raises another interesting point: Any investor using margin should, in theory, calculate his potential interest charge using the compounding formula. However, as a matter of practicality, extremely few investors do. An example of this compounding effect on a covered call write is presented in Chapter 2.

BACK TO CONVERSIONS AND REVERSALS

Profit calculation similar to the conversion profit formula is necessary for the reversal arbitrage. Since the reversal necessitates shorting stock, the trader must pay out any dividends on the stock during the time in which the position is held. However, he is now bringing in a credit when the position is established, and this money can be put to work to earn interest. In a reversal, then, the dividend is a cost and the interest earned is a profit.

Example: Use the same XYZ details described above: The stock is going to pay a ½-point dividend, the position will be held for three months, and the money will earn interest at a rate of ½ of 1% per month. If the trader were contemplating an arbitrage with a striking price of 30, the fixed cost would be:

$$\begin{aligned}\text{Reversal fixed cost} &= \text{Dividend to be paid} - \text{Interest rate per month} \times \\ &\quad\ \text{Months held} \times \text{Striking price} \\ &= .50 - .005 \times 3 \times 30 \\ &= 1/2 - .045 = .005 \text{ point}\end{aligned}$$

The fixed cost in this reversal is extremely small. In fact, the reader should be able to see that it is often possible – even probable – that there will be a fixed credit, not a fixed cost, in a reversal arbitrage. To verify this, rework the example with a striking price of 50 or 60. As in a conversion, the fixed cost (or profit) in a reversal is a number that can be used for the entire trading day. It will not change.

BORROWING STOCK TO SELL SHORT

The above example assumes that the arbitrageur earns the full carrying rate on the short stock. Only certain arbitrageurs are actually able to earn that rate. When one sells stock short, he must actually borrow the stock from someone who owns it, and then the seller goes into the market to sell the stock. When customers of brokerage firms keep stock in a margin account, they agree to let the brokerage firm loan their stock out without the customer's specific approval. Thus, if an arbitrageur working for that brokerage firm wanted to establish a reversal, and if the stock to be sold short in the reversal were available in one of the margin accounts, the arbitrageur could borrow that stock and earn the full carrying rate on it. This is called "using box stock," since stock held in margin accounts is generally referred to as being in the "box."

There are other times, however, when an arbitrageur wants to do a reversal but does not have access to "box" stock. He must then find someone else from whom to borrow the stock. Obviously, there are people who own stock and would loan it to arbitrageurs for a fee. There are people who specialize in matching up investors with stock to loan and arbitrageurs who want to borrow stock. These people are said to be in the "stock loan" business. Generally, the fee for borrowing stock in this manner is anywhere from 10 to 20% of the prevailing carrying cost rate. For example, if the current carrying rate were 10% annually, then one would expect to pay 1 or 2% to the lender to borrow his stock. This reduces the profitability of the reversal slightly. Since small margins are being worked with, this cost to borrow the stock may make a significant difference to the arbitrageur.

These variations in the rates that an arbitrageur can earn on the credit balances in his account affect the marketplace. For example, a particular reversal might be

available in the marketplace at a net profit of ½ point, or 50 cents. Such a reversal may not be equally attractive to all arbitrageurs. Those who have "box" stock may be willing to do the reversal for 50 cents; those who have to pay 1% to borrow stock may want 0.55 for the reversal; and those who pay 2% to borrow stock may need 0.65 for the reversal. Thus, arbitrageurs who do conversions and reversals are in competition with each other not only in the marketplace, but in the stock loan arena as well.

Reversals are generally easier positions for the arbitrageur to locate than are conversions. This is because the fixed cost of the conversion has a rather burdensome effect. Only if the stock pays a rather large dividend that outweighs the carrying cost could the fixed portion of the conversion formula ever be a profit as opposed to a cost. In practice, the interest rate paid to carry stock is probably higher than the interest earned from being short stock, but any reasonable computer program should be able to handle two different interest rates.

The novice trader may find the term "conversion" somewhat illogical. In the over-the-counter option markets, the dealers create a position similar to the one shown here as a result of actually converting a put to a call.

Example: When someone owns a conventional put on XYZ with a striking price of 60 and the stock falls to 50, there is often little chance of being able to sell the put profitably in the secondary market. The over-the-counter option dealer might offer to convert the put into a call. To do this, he would buy the put from the holder, then buy the stock itself, and then offer a call at the original striking price of 60 to the holder of the put. Thus, the dealer would be long the stock, long the put, and short the call – a conversion. The customer would then own a call on XYZ with a striking price of 60, due to expire on the same date that the put was destined to. The put that the customer owned has been converted into a call. To effect this conversion, the dealer pays out to the customer the difference between the current stock price, 50, and the striking price, 60. Thus, the customer receives $1,000 for this conversion. Also, the dealer would charge the customer for costs to carry the stock, so that the dealer had no risk. If the stock rallied back above 60, the customer could make more money, because he owns the call. The dealer has no risk, as he has an arbitrage position to begin with. In a similar manner, the dealer can effect a reverse conversion – converting a call to a put – but will charge the dividends to the customer for doing so.

RISKS IN CONVERSIONS AND REVERSALS

Conversions and reversals are generally considered to be riskless arbitrage. That is, the profit in the arbitrage is fixed from the start and the subsequent movement of the

underlying stock makes no difference in the eventual outcome. This is generally a true statement. However, there are some risks, and they are great enough that one can actually lose money in conversions and reversals if he does not take care. The risks are fourfold in reversal arbitrage: An extra dividend is declared, the interest rate falls while the reversal is in place, an early assignment is received, or the stock is exactly at the striking price at expiration. Converters have similar risks: a dividend cut, an increase in the interest rate, early assignment, or the stock closing at the strike at expiration.

These risks are first explored from the viewpoint of the reversal trader. If the company declares an extra dividend, it is highly likely that the reversal will become unprofitable. This is so because most extra dividends are rather large – more than the profit of a reversal. There is little the arbitrageur can do to avoid being caught by the declaration of a truly extra dividend. However, some companies have a track record of declaring extras with annual regularity. The arbitrageur should be aware of which companies these are and of the timing of these extra dividends. A clue sometimes exists in the marketplace. If the reversal appears overly profitable when the arbitrageur is first examining it (before he actually establishes it), he should be somewhat skeptical. Perhaps there is a reason why the reversal looks so tempting. An extra dividend that is being factored into the opinion of the marketplace may be the answer.

The second risk is that of variation in interest rates while the reversal is in progress. Obviously, rates can change over the life of a reversal, normally 3 to 6 months. There are two ways to compensate for this. The simplest way is to leave some room for rates to move. For example, if rates are currently at 12% annually, one might allow for a movement of 2 to 3% in rates, depending on the length of time the reversal is expected to be in place. In order to allow for a 2% move, the arbitrageur would calculate his initial profit based on a rate of 10%, 2% less than the currently prevailing 12%. He would not establish any reversal that did not at least break even with a 10% rate. The rate at which a reversal breaks even is often called the "effective rate" – 10% in this case. Obviously, if rates average higher than 10% during the life of the reversal, it will make money. Normally, when one has an entire portfolio of reversals in place, he should know the effective rate of each set of reversals expiring at the same time. Thus, he would have an effective rate for his 2-month reversals, his 3-month ones, and so forth.

Allowing this room for rates to move does not necessarily mean that there will not be an adverse affect if rates do indeed fall. For example, rates could fall farther than the room allowed. Thus, a further measure is necessary in order to completely protect against a drop in rates: One should invest his credit balances generated by the reversals in interest-bearing paper that expires at approximately the same time the reversals do, and that bears interest at a rate that locks in a profit for the reversal

account. For example, suppose that an arbitrageur has \$5 million in 3-month reversals at an effective rate of 10%. If he can buy \$5 million worth of 3-month Certificates of Deposit with a rate of 11½%, then he would lock in a profit of 1½% on his \$5 million. This method of using paper to hedge rate fluctuations is not practiced by all arbitrageurs; some think it is not worth it. They believe that by leaving the credit balances to fluctuate at prevailing rates, they can make more if rates go up, and that will cushion the effect when rates decline.

The third risk of reversal arbitrage is reception of an early assignment on the short puts. This forces the arbitrageur to buy stock and incur a debit. Thus, the position does not earn as much interest as was originally assumed. If the assignment is received early enough in the life of the reversal (recall that in-the-money puts can be assigned very far in advance of expiration), the reversal could actually incur an overall loss. Such early assignments normally occur during bearish markets. The only advantage of this early assignment is that one is left with unhedged long calls; these calls are well out-of-the-money and normally quite low-priced (¼ or less). If the market should reverse and turn bullish before the expiration of the calls, the arbitrageur may make money on them. There is no way to hedge completely against a market decline, but it does help if the arbitrageur tries to establish reversals with the call in-the-money and the put out-of-the-money. That, plus demanding a better overall return for reversals near the strike, should help cushion the effects of the bear market.

The final risk is the most common one, that of the stock closing exactly at the strike at expiration. This presents the arbitrageur with a decision to make regarding exercise of his long calls. Since the stock is exactly at the strike, he is not sure whether he will be assigned on his short puts at expiration. The outcome is that he may end up with an unhedged stock position on Monday morning after expiration. If the stock should open on a gap, he could have a substantial loss that wipes out the profits of many reversals. This risk of stock closing at the strike may seem minute, but it is not. In the absence of any real buying or selling in the stock on expiration day, the process of discounting will force a stock that is near the strike virtually right onto the strike. Once it is near the strike, this risk materializes.

There are two basic scenarios that could occur to produce this unhedged stock position. First, suppose one decides that he will not get put and he exercises his calls. However, he was wrong and he *does* get put. He has bought double the amount of stock – once via call exercise and again via put assignment. Thus, he will be *long* on Monday morning. The other scenario produces the opposite effect. Suppose one decides that he *will* get put and he decides not to exercise his calls. If he is wrong in this case, he does not buy any stock – he didn't exercise nor did he get put. Consequently, he will be *short* stock on Monday morning.

If one is truly undecided about whether he will be assigned on his short puts, he might look at several clues. First, has any late news come out on Friday evening that might affect the market's opening or the stock's opening on Monday morning? If so, that should be factored into the decision regarding exercising the calls. Another clue arises from the price at which the stock was trading during the Friday expiration day, prior to the close. If the stock was below the strike for most of the day before closing at the strike, then there is a greater chance that the puts will be assigned. This is so because other arbitrageurs (discounters) have probably bought puts and bought stock during the day and will exercise to clean out their positions.

If there is still doubt, it may be wisest to exercise only half of the calls, hoping for a partial assignment on the puts (always a possibility). This halfway measure will normally result in some sort of unhedged stock position on Monday morning, but it will be smaller than the maximum exposure by at least half.

Another approach that the arbitrageur can take if the stock is near the strike of the reversal during the late trading of the options' life – during the last few days – is to roll the reversal to a later expiration or, failing that, to roll to another strike in the same expiration. First, let us consider rolling to another expiration. The arbitrageur knows the dollar price that equals his effective rate for a 3-month reversal. If the current options can be closed out and new options opened at the next expiration for at least the effective rate, then the reversal should be rolled. This is not a likely event, mostly due to the fact that the spread between the bid and asked prices on four separate options makes it difficult to attain the desired price. *Note:* This entire four-way order can be entered as a spread order; it is not necessary to attempt to "leg" the spread.

The second action – rolling to another strike in the same expiration month – may be more available. Suppose that one has the July 45 reversal in place (long July 45 call and short July 45 put). If the underlying stock is near 45, he might place an order to the exchange floor as a three-way spread: Sell the July 45 call (closing), buy the July 45 put (closing), and sell the July 40 call (opening) for a net credit of 5 points. This action costs the arbitrageur nothing except a small transaction charge, since he is receiving a 5-point credit for moving the strike by 5 points. Once this is accomplished, he will have moved the strike approximately 5 points away and will thus have avoided the problem of the stock closing at the strike.

Overall, these four risks are significant, and reversal arbitrageurs should take care that they do not fall prey to them. The careless arbitrageur uses effective rates too close to current market rates, establishes reversals with puts in-the-money, and routinely accepts the risk of acquiring an unhedged stock position on the morning after expiration. He will probably sustain a large loss at some time. Since many reversal arbitrageurs work with small capital and/or have convinced their backers that it is

a riskless strategy, such a loss may have the effect of putting them out of business. That is an unnecessary risk to take. There are countermeasures, as described above, that can reduce the effects of the four risks.

Let us consider the risks for conversion traders more briefly. The risk of stock closing near the strike is just as bad for the conversion as it is for the reversal. The same techniques for handling those risks apply equally well to conversions as to reversals. The other risks are similar to reversal risks, but there are slight nuances.

The conversion arbitrage suffers if there is a dividend cut. There is little the arbitrageur can do to predict this except to be aware of the fundamentals of the company before entering into the conversion. Alternatively, he might avoid conversions in which the dividend makes up a major part of the profit of the arbitrage.

Another risk occurs if there is an early assignment on the calls before the ex-dividend date and the dividend is not received. Moreover, an early assignment leaves the arbitrageur with long puts, albeit fractional ones since they are surely deeply out-of-the-money. Again, the policy of establishing conversions in which the dividend is not a major factor would help to ease the consequences of early assignment.

The final risk is that interest rates increase during the time the conversion is in place. This makes the carrying costs larger than anticipated and might cause a loss. The best way to hedge this initially is to allow a margin for error. Thus, if the prevailing interest rate is 12%, one might only establish reversals that would break even if rates rose to 14%. If rates do not rise that far on average, a profit will result. The arbitrageur can attempt to hedge this risk by *shorting* interest-bearing paper that matures at approximately the same time as the conversions. For example, if one has \$5 million worth of 3-month conversions established at an effective rate of 14% and he shorts 3-month paper at 12½%, he locks in a profit of 1½%. This is not common practice for conversion arbitrageurs, but it does hedge the effect of rising interest rates.

SUMMARY OF CONVERSION ARBITRAGE

The practice of conversion and reversal arbitrage in the listed option markets helps to keep put and call prices in line. If arbitrageurs are active in a particular option, the prices of the put and call will relate to the stock price in line with the formulae given earlier. Note that this is also a valid reason why puts tend to sell at a lower price than calls do. The cost of money is the determining factor in the difference between put and call prices. In essence, the "cost" (although it may sometimes be a credit) is subtracted from the theoretical put price. Refer again to the formula given above for the profit potential of a conversion. Assume that things are in perfect alignment. Then the formula would read:

Put price = Striking price + Call price – Stock price – Fixed cost

Furthermore, if the stock is at the striking price, the formula reduces to:

Put price = Call price – Fixed cost

So, whenever the fixed cost, which is equal to the carrying charge less the dividends, is greater than zero (and it usually is), the put will sell for less than the call if a stock is at the striking price. Only in the case of a large-dividend-paying stock, when the fixed cost becomes negative (that is, it is not a cost, but a credit), does the reverse hold true. This is supportive evidence for statements made earlier that at-the-money calls sell for more than at-the-money puts, all other things being equal. The reader can see quite clearly that it has nothing to do with supply and demand for the puts and calls, a fallacy that is sometimes proffered. This same sort of analysis can be used to prove the broader statement that calls have a greater time value premium than puts do, except in the case of a large-dividend-paying stock.

One final word of advice should be offered to the public customer. He may sometimes be able to find conversions or reversals, by using the simplistic formula, that appear to have profit potentials that exceed commission costs. Such positions do exist from time to time, but the rate of return to the public customer will almost assuredly be less than the short-term cost of money. If it were not, arbitrageurs would be onto the position very quickly. The public option trader may not actually be thinking in terms of comparing the profit potential of a position with what he could get by placing the money into a bank, but he must do so to convince himself that he cannot feasibly attempt conversion or reversal arbitrages.

THE "INTEREST PLAY"

In the preceding discussion of reversal arbitrage, it is apparent that a substantial portion of the arbitrageur's profits may be due to the interest earned on the credit of the position. Another type of position is used by many arbitrageurs to take advantage of this interest earned. The arbitrageur sells the underlying stock short and simultaneously buys an in-the-money call that is trading slightly over parity. The actual amount over parity that the arbitrageur can afford to pay for the call is determined by the interest that he will earn from his short sale and the dividend payout before expiration. He does not use a put in this type of position. In fact, this "interest play" strategy is merely a reversal arbitrage without the short put. This slight variation has a residual benefit for the arbitrageur: If the underlying stock should drop dramatically in price, he could make large profits because he is short the underlying stock. In any case, *he will make his interest credit less the amount of time value premium paid for the call less any dividends lost.*

Example 1: XYZ is sold short at 60, and a January 50 call is bought for 10¼ points. Assume that the prevailing interest rate is 1% per month and that the position is established one month prior to expiration. XYZ pays no dividend. The total credit brought in from the trades is $4,975, so the arbitrageur will earn $49.75 in interest over the course of 1 month. If the stock is above 50 at expiration, he will exercise his call to buy stock at 50 and close the position. His loss on the security trades will be $25 – the amount of time value premium paid for the call option. (He makes 10 points by selling stock at 60 and buying at 50, but loses 10¼ points on the exercised call.) His overall profit is thus $24.75.

Example 2: A real-life example may point out the effect of interest rates even more dramatically. In early 1979, IBM April 240 calls with about six weeks of life remaining were over 60 points in-the-money. IBM was not going to be ex-dividend in that time. Normally, such a deeply in-the-money option would be trading at parity or even a discount when the time remaining to expiration is so short. However, these calls were trading 3½ points over parity because of the prevailing high interest rates at the time. IBM was at 300, the April 240 calls were trading at 63½, and the prevailing interest rate was approximately 1% per month. The credit from selling the stock and buying the call was $23,700, so the arbitrageur earned $365.50 in interest for 1½ months, and lost $350 – the 3½ points of time value premium that he paid for the call. This still left enough room for a profit.

In Chapter 1, it was stated that interest rates affect option prices. The above examples of the "interest play" strategy quite clearly show why. As interest rates rise, the arbitrageur can afford to pay more for the long call in this strategy, thus causing the call price to increase in times of high interest rates. If call prices are higher, so will put prices be, as the relationships necessary for conversion and reversal arbitrage are preserved. Similarly, if interest rates decline, the arbitrageur will make lower bids, and call and put prices will be lower. They are active enough to give truth to the theory that option prices are directly related to interest rates.

THE BOX SPREAD

An arbitrage consists of simultaneously buying and selling the same security or equivalent securities at different prices. For example, the reversal consists of selling a put and simultaneously shorting stock and buying a call. The reader will recall that the short stock/long call position was called a synthetic put. That is, shorting the stock and buying a call is equivalent to buying a put. The reversal arbitrage therefore consists of selling a (listed) put and simultaneously buying a (synthetic) put. In a similar

manner, the conversion is merely the purchase of a (listed) put and the simultaneous sale of a (synthetic) put. Many equivalent strategies can be combined for arbitrage purposes. One of the more common ones is the box spread.

Recall that it was shown that a bull spread or a bear spread could be constructed with either puts or calls. Thus, if one were to simultaneously buy a (call) bull spread and buy a (put) bear spread, he could have an arbitrage. In essence, he is merely buying and selling equivalent spreads. If the price differentials work out correctly, a risk-free arbitrage may be possible.

Example: The following prices exist:

XYZ common, 55

XYZ January 50 call, 7

XYZ January 50 put, 1

XYZ January 60 call, 2

XYZ January 60 put, $5^1/_2$

The arbitrageur could establish the box spread in this example by executing the following transactions:

Buy a call bull spread:		
Buy XYZ January 50 call	7 debit	
Sell XYZ January 60 call	2 credit	
Net call cost		5 debit
Buy a put bear spread:		
Buy XYZ January 60 put	$5^1/_2$ debit	
Sell XYZ January 50 put	1 credit	
Net put cost		$4^1/_2$ debit
Total cost of position		$9^1/_2$ debit

No matter where XYZ is at January expiration, this position will be worth 10 points. *The arbitrageur has locked in a risk-free profit* of $^1/_2$ point, since he "bought" the box spread for $9^1/_2$ points and will be able to "sell" it for 10 points at expiration. To verify this, evaluate the position at expiration, first with XYZ above 60, then with XYZ between 50 and 60, and finally with XYZ below 50. If XYZ is above 60 at expiration, the puts will expire worthless and the call bull spread will be at its maximum potential of 10 points, the difference between the striking prices. Thus, the position can be liquidated for 10 points if XYZ is above 60 at expiration. Now assume that XYZ is

between 50 and 60 at expiration. In that case, the out-of-the-money, written options would expire worthless – the January 60 call and the January 50 put. This would leave a long, in-the-money combination consisting of a January 50 call and a January 60 put. These two options must have a total value of 10 points at expiration with XYZ between 50 and 60. (For example, the arbitrageur could exercise his call to buy stock at 50 and exercise his put to sell stock at 60.) Finally, assume that XYZ is below 50 at expiration. The calls would expire worthless if that were true, but the remaining put spread – actually a bear spread in the puts – would be at its maximum potential of 10 points. Again, the box spread could be liquidated for 10 points.

The arbitrageur must pay a cost to carry the position, however. In the prior example, if interest rates were 6% and he had to hold the box for 3 months, it would cost him an additional 14 cents ($.06 \times 9\frac{1}{2} \times \frac{3}{12}$). This still leaves room for a profit.

In essence, a bull spread (using calls) was purchased while a bear spread (using puts) was bought. The box spread was described in these terms only to illustrate the fact that the arbitrageur is buying and selling equivalent positions. The arbitrageur who is utilizing the box spread should not think in terms of bull or bear spread, however. Rather, he should be concerned with "buying" the entire box spread at a cost of less than the differential between the two striking prices. By "buying" the box spread, it is meant that both the call spread portion and the put spread portion are debit spreads. *Whenever the arbitrageur observes that a call spread and a put spread using the same strikes and that are both debit spreads can be bought for less than the difference in the strikes plus carrying costs, he should execute the arbitrage.*

Obviously, there is a companion strategy to the one just described. It might sometimes be possible for the arbitrageur to "sell" both spreads. That is, he would establish a credit call spread and a credit put spread, using the same strikes. *If this credit were greater than the difference in the striking prices, a risk-free profit would be locked in.*

Example: Assume that a different set of prices exists:

XYZ common, 75
XYZ April 70 call, $8\frac{1}{2}$
XYZ April 70 put, 1
XYZ April 80 call, 3
XYZ April 80 put, 6

By executing the following transactions, the box spread could be "sold":

Sell a call (bear) spread:		
Buy April 80 call	3 debit	
Sell April 70 call	$8^1/_2$ credit	
Net credit on calls		$5^1/_2$
Sell a put (bull) spread:		
Buy April 70 put	1 debit	
Sell April 80 put	6 credit	
Net credit on puts		5 credit
Total credit of position		$10^1/_2$ credit

In this case, no matter where XYZ is at expiration, the position can be bought back for 10 points. This means that the arbitrageur has locked in risk-free profit of ½ point. To verify this statement, first assume that XYZ is above 80 at April expiration. The puts will expire worthless, and the call spread will have widened to 10 points – the cost to buy it back. Alternatively, if XYZ were between 70 and 80 at April expiration, the long, out-of-the-money options would expire worthless and the in-the-money combination would cost 10 points to buy back. (For example, the arbitrageur could let himself be put at 80, buying stock there, and called at 70, selling the stock there – a net "cost" to liquidate of 10 points.) Finally, if XYZ were below 70 at expiration, the calls would expire worthless and the put spread would have widened to 10 points. It could then be closed out at a cost of 10 points. In each case, the arbitrageur is able to liquidate the box spread by buying it back at 10.

In this sale of a box spread, he would earn interest on the credit received while he holds the position.

There is an additional factor in the profitability of the box spread. Since the sale of a box generates a credit, the arbitrageur who sells a box will earn a small amount of money from that sale. Conversely, the purchaser of a box spread will have a charge for carrying cost. Since profit margins may be small in a box arbitrage, these carrying costs can have a definite effect. As a result, boxes may actually be sold for 5 points, even though the striking prices are 5 points apart, and the arbitrageur can still make money because of the interest earned.

These box spreads are not easy to find. If one does appear, the act of doing the arbitrage will soon make the arbitrage impossible. In fact, this is true of any type of arbitrage; it cannot be executed indefinitely because the mere act of arbitraging will force the prices back into line. Occasionally, the arbitrageur will be able to find the option quotes to his liking, especially in volatile markets, and can establish a risk-free

arbitrage with the box spread. It can be evaluated at a glance. Only two questions need to be answered:

1. If one were to establish a debit call spread and a debit put spread, using the same strikes, would the total cost be *less than* the difference in the striking prices plus carrying costs? If the answer is yes, an arbitrage exists.
2. Alternatively, if one were to sell both spreads – establishing a credit call spread and a credit put spread – would the total credit received plus interest earned be *greater than* the difference in the striking prices? If the answer is yes, an arbitrage exists.

There are some risks to box arbitrage. Many of them are the same as those risks faced by the arbitrageur doing conversions or reversals. First, there is risk that the stock might close at either of the two strikes. This presents the arbitrageur with the same dilemma regarding whether or not to exercise his long options, since he is not sure whether he will be assigned. Additionally, early assignment may change the profitability: Assignment of a short put will incur large carrying costs on the resulting long stock; assignment of a short call will inevitably come just before an ex-dividend date, costing the arbitrageur the amount of the dividend.

There are not many opportunities to actually transact box arbitrage, but the fact that such arbitrage exists can help to keep markets in line. For example, if an underlying stock begins to move quickly and order flow increases dramatically, the specialist or market-markers in that stock's options may be so inundated with orders that they cannot be sure that their markets are correct. They can use the principles of box arbitrage to keep prices in line. The most active options would be the ones at strikes nearest to the current stock price. The specialist can quickly add up the markets of the call and put at the nearest strike above the stock price and add to that the markets of the options at the strike just below. The sum of the four should add up to a price that surrounds the difference in the strikes. If the strikes are 5 points apart, then the sum of the four markets should be something like 4½ bid, 5½ asked. If, instead, the four markets add up to a price that allows box arbitrage to be established, then the specialist will adjust his markets.

VARIATIONS ON EQUIVALENCE ARBITRAGE

Other variations of arbitrage on equivalent positions are possible, although they are relatively complicated and probably not worth the arbitrageur's time to analyze. For example, one could buy a butterfly spread with calls and simultaneously sell a butterfly spread using puts. A listed straddle could be sold and a synthetic straddle

could be bought – short stock and long 2 calls. Inversely, a listed straddle could be bought against a ratio write – long stock and short 2 calls. The only time the arbitrageur should even consider anything like this is when there are more sizable markets in certain of the puts and calls than there are in others. If this were the case, he might be able to take an ordinary box spread, conversion, or reversal and add to it, keeping the arbitrage intact by ensuring that he is, in fact, buying and selling equivalent positions.

THE EFFECTS OF ARBITRAGE

The arbitrage process serves a useful purpose in the listed options market, because it may provide a secondary market where one might not otherwise exist. Normally, public interest in an in-the-money option dwindles as the option becomes deeply in-the-money or when the time remaining until expiration is very short. There would be few public buyers of these options. In fact, public selling pressure might increase, because the public would rather liquidate in-the-money options held long than exercise them. The few public buyers of such options might be writers who are closing out. However, if the writer is covered, especially where call options are concerned, he might decide to be assigned rather than close out his option. This means that the public seller is creating a rather larger supply that is not offset by a public demand. The market created by the arbitrageur, especially in the basic put or call arbitrage, essentially creates the demand. Without these arbitrageurs, there could conceivably be no buyers at all for those options that are short-lived and in-the-money, after public writers have finished closing out their positions.

Equivalence arbitrage – conversion, reversals, and box spreads – helps to keep the relative prices of puts and calls in line with each other and with the underlying stock price. This creates a more efficient and rational market for the public to operate in. The arbitrageur would help eliminate, for example, the case in which a public customer buys a call, sees the stock go up, but cannot find anyone to sell his call to at higher prices. If the call were too cheap, arbitrageurs would do reversals, which involve call purchases, and would therefore provide a market to sell into.

Questions have been raised as to whether option trading affects stock prices, especially at or just before an expiration. If the amount of arbitrage in a certain issue becomes very large, it could appear to temporarily affect the price of the stock itself. For example, take the call arbitrage. This involves the sale of stock in the market. The corresponding stock purchase, via the call exercise, is not executed on the exchange. Thus, as far as the stock market is concerned, there may appear to be an inordinate amount of selling in the stock. If large numbers of basic call arbitrages are taking place, they might thus hold the price of the stock down until the calls expire.

The put arbitrage has an opposite effect. This arbitrage involves buying stock in the market. The offsetting stock sale via the put exercise takes place off the exchange. If a large amount of put arbitrage is being done, there may appear to be an inordinate amount of buying in the stock. Such action might temporarily hold the stock price up.

In a vast majority of cases, however, the arbitrage has no visible effect on the underlying stock price, because the amount of arbitrage being done is very small in comparison to the total number of trades in a given stock. Even if the open interest in a particular option is large, allowing for plenty of option volume by the arbitrageurs, the actual act of doing the arbitrage will force the prices of the stock and option back into line, thus destroying the arbitrage.

Rather elaborate studies, including doctoral theses, have been written that try to prove or disprove the theory that option trading affects stock prices. Nothing has been proven conclusively, and it may never be, because of the complexity of the task. Logic would seem to dictate that arbitrage could temporarily affect a stock's movement if it has discount, in-the-money options shortly before expiration. However, one would have to reasonably conclude that the size of these arbitrages could almost never be large enough to overcome a directional trend in the underlying stock itself. Thus, in the absence of a definite direction in the stock, arbitrage might help to perpetuate the inertia; but if there were truly a preponderance of investors wanting to buy or sell the stock, these investors would totally dominate any arbitrage that might be in progress.

RISK ARBITRAGE USING OPTIONS

Risk arbitrage is a strategy that is well described by its name. It is basically an arbitrage – the same or equivalent securities are bought and sold. However, *there is generally risk because the arbitrage usually depends on a future event occurring in order for the arbitrage to be successful.* One form of risk arbitrage was described earlier concerning the speculation on the size of a special dividend that an underlying stock might pay. That arbitrage consisted of buying the stock and buying the put, when the put's time value premium is less than the amount of the projected special dividend. The risk lies in the arbitrageur's speculation on the size of the anticipated special dividend.

MERGERS

Risk arbitrage is an age-old type of arbitrage in the stock market. *Generally, it concerns speculation on whether a proposed merger or acquisition will actually go through as proposed.*

Example: XYZ, which is selling for $50 per share, offers to buy out LMN and is offering to swap one share of its (XYZ's) stock for every two shares of LMN. This would mean that LMN should be worth $25 per share if the acquisition goes through as proposed. On the day the takeover is proposed, LMN stock would probably rise to about $22 per share. It would not trade all the way up to 25 until the takeover was approved by the shareholders of LMN stock. The arbitrageur who feels that this takeover will be approved can take action. He would sell short XYZ and, for every share that he is short, he would buy 2 shares of LMN stock. If the merger goes through, he will profit. The reason that he shorts XYZ as well as buying LMN is to protect himself in case the market price of XYZ drops before the acquisition is approved. In essence, he has sold XYZ and also bought the equivalent of XYZ (two shares of LMN will be equal to one share of XYZ if the takeover goes through). This, then, is clearly an arbitrage. However, it is a risk arbitrage because, if the stockholders of LMN reject the offer, he will surely lose money. His profit potential is equal to the remaining differential between the current market price of LMN (22) and the takeover price (25). If the proposed acquisition goes through, the differential disappears, and the arbitrageur has his profit.

The greatest risk in a merger is that it is canceled. If that happens, stock being acquired (LMN) will fall in price, returning to its pre-takeover levels. In addition, the acquiring stock (XYZ) will probably rise. Thus, the risk arbitrageur can lose money on both sides of his trade. *If either or both of the stocks involved in the proposed takeover have options, the arbitrageur may be able to work options into his strategy.*

In merger situations, since large moves can occur in both stocks (they move in concert), option purchases are the preferable option strategy. If the acquiring company (XYZ) has in-the-money puts, then the purchase of those puts may be used instead of selling XYZ short. The advantage is that if XYZ rallies dramatically during the time it takes for the merger to take effect, then the arbitrageur's profits will be increased.

Example: As above, assume that XYZ is at 50 and is acquiring LMN in a 2-for-1 stock deal. LMN is at 22. Suppose that XYZ rallies to 60 by the time the deal closes. This would pull LMN up to a price of 30. If one had been short 100 XYZ at 50 and long 200 LMN at 22, then his profit would be $600 – a $1,600 gain on the 200 long LMN minus a $1,000 loss on the XYZ short sale.

Compare that result to a similar strategy substituting a long put for the short XYZ stock. Assume that he buys 200 LMN as before, but now buys an XYZ put. If one could buy an XYZ July 55 put with little time premium, say at 5½ points, then he would have nearly the same dollars of profit if the merger should go through with XYZ below 55.

However, when XYZ rallies to 60, his profit increases. He would still make the $1,600 on LMN as it rose from 22 to 30, but now would only lose $550 on the XYZ put – a total profit of $1,050 as compared to $600 with an all-stock position.

The disadvantage to substituting long puts for short stock is that the arbitrageur does not receive credit for the short sale and, therefore, does not earn money at the carrying rate. This might not be as large a disadvantage as it initially seems, however, since it is often the case that it is very expensive – even impossible – to borrow the acquiring stock in order to short it. If the stock borrow costs are very large or if no stock can be located for borrowing, the purchase of an in-the-money put is a viable alternative. The purchase of an in-the-money put is preferable to an at- or out-of-the-money put, because the amount of time value premium paid for the latter would take too much of the profitability away from the arbitrage if XYZ stayed unchanged or declined. This strategy may also save money if the merger falls apart and XYZ rises. The loss on the long put may well be less than the loss would be on short XYZ stock.

Note also that one could sell the XYZ July 55 call short as well as buy the put. This would, of course, be synthetic short stock and is a pure substitute for shorting the stock. The use of this synthetic short is recommended only when the arbitrageur cannot borrow the acquiring stock. If this is his purpose, he should use the in-the-money put and out-of-the-money call, since if he were assigned on the call, he could not borrow the stock to deliver it as a short sale. The use of an out-of-the-money call lessens the chance of eventual assignment.

The companion strategy is to buy an in-the-money call instead of buying the company being acquired (LMN). This has advantages if the stock falls too far, either because the merger falls apart or because the stocks in the merger decline too far. Additionally, the cost of carrying the long LMN stock is eliminated, although that is generally built into the cost of the long calls. The larger amount of time value premium in calls as compared to puts makes this strategy often less attractive than that of buying the puts as a substitute for the short sale.

One might also consider selling options instead of buying them. Generally this is an inferior strategy, but in certain instances it makes sense. The reason that option sales are inferior is that they do not limit one's risk in the risk arbitrage, but they cut off the profit. For example, if one sells puts on the company being acquired (LMN), he has a bullish situation. However, if the company being acquired (XYZ) rallies too far, there will be a loss, because the short puts will stop making money as soon as LMN rises through the strike. This is especially disconcerting if a takeover bidding war should develop for LMN. The arbitrageur who is long LMN will participate nicely as LMN rises heavily in price during the bidding war. However, the put seller will not participate to nearly the same extent.

The sale of in-the-money calls as a substitute for shorting the acquiring company (XYZ) can be beneficial at certain times. It is necessary to have a plus tick in order to sell stock short. When many arbitrageurs are trying to sell a stock short at the same time, it may be difficult to sell such stock short. Morever, natural owners of XYZ may see the arbitrageurs holding the price down and decide to sell their long stock rather than suffer through a possible decline in the stock's price while the merger is in progress. Additionally, buyers of XYZ will become very timid, lowering their bids for the same reasons. All of this may add up to a situation in which it is very difficult to sell the stock short, even if it can be borrowed. The sale of an in-the-money call can overcome this difficulty. The call should be deeply in-the-money and not be too long-term, for the arbitrageur does not want to see XYZ decline below the strike of the call. If that happened, he would no longer be hedged; the other side of the arbitrage – the long LMN stock – would continue to decline, but he would not have any remaining short against the long LMN.

LIMITS ON THE MERGER

There is another type of merger for stock that is more difficult to arbitrage, but options may prove useful. In some merger situations, the acquiring company (XYZ) promises to give the shareholders of the company being acquired (LMN) an amount of stock equal to a set dollar price. This amount of stock would be paid even if the acquiring company rose or fell moderately in price. If XYZ falls too far, however, it cannot pay out an extraordinarily increased number of shares to LMN shareholders, so XYZ puts a limit on the maximum number of shares that it will pay for each share of LMN stock. Thus, the shareholders of XYZ are guaranteed that there will be some downside buffer in terms of dilution of their company in case XYZ declines, as is often the case for an acquiring company. However, if XYZ declines too far, then LMN shareholders will receive less. In return for getting this downside guarantee, XYZ will usually also stipulate that there is a *minimum* amount of shares that they will pay to LMN shareholders, even if XYZ stock rises tremendously. Thus, if XYZ should rise tremendously in price, then LMN shareholders will do even better than they had anticipated. An example will demonstrate this type of merger accord.

Example: Assume that XYZ is at 50 and it intends to acquire LMN for a stated price of $25 per share, as in the previous example. However, instead of merely saying that it will exchange two shares of LMN for one share of XYZ, the company says that it wants the offer to be worth $25 per share to LMN shareholders as long as XYZ is between 45 and 55. Given this information, we can determine the maximum and minimum number of shares that LMN shareholders will receive: The maximum is

the stated price, 25, divided by the lower limit, 45, or 0.556 shares; the minimum is 25 divided by the higher limit, 55, or 0.455.

This type of merger is usually stated in terms of how many shares of XYZ will be issued, rather than in terms of the price range that XYZ will be able to move in. In either case, one can be derived from the other, so that the manner in which the merger deal is stated is merely a convention. In this case, for example, the merger might be stated as being worth $25 per share, with each share of LMN being worth at least 0.455 shares of XYZ and at most 0.556 shares of XYZ. Note that these ratios make the deal worth 25 as long as XYZ is between 45 and 55: 45 times 0.556 equals 25, as does 0.455 times 55.

If the acquiring stock, XYZ, is between 45 and 55 at the time the merger is completed, then the number of shares of XYZ that each LMN shareholder will receive is determined in a preset manner. Usually, at the time the merger is announced, XYZ will say that its price on the closing date of the merger will be used to establish the proper ratio. As a slight alternative, sometimes the acquiring company will state that the price to be used in determining the final ratio is to be an average of the closing prices of the stock over a stated period of time. This stated period of time might be something like the 10 days prior to the closing of the merger.

Example: Suppose that the closing price of XYZ on the day that the merger closes is to be the price used in the ratio. Furthermore, suppose that XYZ closes at 51 on that day. It is within the prestated range, so a calculation must be done in order to determine how many shares of XYZ each LMN shareholder will get. This ratio is determined by dividing the stated price, 25, by the price in question, 51. This would give a final ratio of 0.490196. The final ratio is usually computed to a rather large number of decimal points in order to assure that LMN shareholders get as close to $25 per share as possible.

The above two examples explain how this type of merger works. A merger of this type is said to have "hooks" – the prices at which the ratio steadies. This makes it difficult to arbitrage. As long as XYZ roams around in the 45 to 55 range, the arbitrageur does not want to short XYZ as part of his arbitrage, because the price of XYZ does not affect the price he will eventually receive for LMN – 25. Rather, he would buy LMN and wait until the deal is near closing before actually shorting XYZ. By waiting, he will know approximately how many shares of XYZ to short for each share of LMN that he owns. The reason that he must short XYZ at the end of the merger is that there is usually a period of time before the physical stock is reorganized from LMN into XYZ. During that time, if he were long LMN, he would be at risk if he did not short XYZ against it.

Problems arise if XYZ begins to fall below 45 well before the closing of the merger, the lower "hook" in the merger. If it should remain below 45, then one should set up the arbitrage as being short 0.556 shares of XYZ for each share of LMN that is held long. As long as XYZ remains below 45 until the merger closes, this is the proper ratio. However, if, after establishing that ratio, XYZ rallies back above 45, the arbitrageur can suffer damaging losses. XYZ may continue to rise in price, creating a loss on the short side. However, LMN will not follow it, because the merger is structured so that LMN is worth 25 unless XYZ rises too far. Thus, the long side stops following as the short side moves higher.

On the other hand, no such problem exists if XYZ rises too far from its original price of 50, going above the upper "hook" of 55. In that case, the arbitrageur would already be long the LMN and would not yet have shorted XYZ, since the merger was not yet closing. LMN would merely follow XYZ higher after the latter had crossed 55.

This is not an uncommon dilemma. Recall that it was shown that the acquiring stock will often fall in price immediately after a merger is announced. Thus, XYZ may fall close to, or below, the lower "hook." Some arbitrageurs attempt to hedge themselves by shorting a little XYZ as it begins to fall near 45 and then completing the short if it drops well below 45. The problem with handling the situation in this way is that one ends up with an inexact ratio. Essentially, he is forcing himself to predict the movements of XYZ.

If the acquiring stock drops below the lower "hook," there may be an opportunity to establish a hedge without these risks if that stock has listed options. The idea is to buy puts on the acquiring company, and for those puts to have a striking price nearly equal to the price of the lower "hook." The proper amount of the company being acquired (LMN) is then purchased to complete the arbitrage. If the acquiring company subsequently rallies back into the stated price range, the puts will not lose money past the striking price and the problems described in the preceding paragraph will have been overcome.

Example: A merger is announced as described in the preceding example: XYZ is to acquire LMN at a stated value of $25 per share, with the stipulation that each share of LMN will be worth at least 0.455 shares of XYZ and at most 0.556 shares. These share ratios equate to prices of 45 and 55 on XYZ.

Suppose that XYZ drops immediately in price after the merger is announced, and it falls to 40. Furthermore, suppose that the merger is expected to close sometime during July and that there are XYZ August 45 puts trading at 5½. This represents only ½ point time value premium. The arbitrageur could then set up the arbitrage by buying 10,000 LMN and buying 56 of those puts. Smaller investors might buy 1,000 LMN and buy 6 puts. Either of these is in approximately the proper ratio of 1 LMN to 0.556 XYZ.

TENDER OFFERS

Another type of corporate takeover that falls under the broad category of risk arbitrage is the tender offer. In a tender offer, the acquiring company normally offers to exchange cash for shares of the company to be acquired. Sometimes the offer is for all of the shares of the company being acquired; sometimes it is for a fractional portion of shares. In the latter case, it is important to know what is intended to be done with the remaining shares. These might be exchanged for shares of the acquiring company, or they might be exchanged for other securities (bonds, most likely), or perhaps there is no plan for exchanging them at all. In some cases, a company tenders for part of its own stock, so that it is in effect both the acquirer and the acquiree. Thus, tender offers can be complicated to arbitrage properly. The use of options can lessen the risks.

In the case in which the acquiring company is making a cash tender for all the shares (called an "any and all" offer), the main use of options is the purchase of puts as protection. One would buy puts on the company being acquired at the same time that he bought shares of that company. If the deal fell apart for some reason, the puts could prevent a disastrous loss as the acquiring stock dropped. The arbitrageur must be judicious in buying these puts. If they are too expensive or too far out-of-the-money, or if the acquiring company might not really drop very far if the deal falls apart, then the purchase of puts is a waste. However, if there is substantial downside risk, the put purchase may be useful.

Selling options in an "any and all" deal often seems like easy money, but there may be risks. If the deal is completed, the company being acquired will disappear and its options would be delisted. Therefore, it may often seem reasonable to sell out-of-the-money puts on the acquiring company. If the deal is completed, these expire worthless at the closing of the merger. However, if the deal falls through, these puts will soar in price and cause a large loss. On the other hand, it may also seem like easy money to sell naked calls with a striking price higher than the price being offered for the stock. Again, if the deal goes through, these will be delisted and expire worthless. The risk in this situation is that another company bids a higher price for the company on which the calls were written. If this happens, there might suddenly be a large upward jump in price, and the written calls could suffer a large loss.

Options can play a more meaningful role in the tender offer that is for only part of the stock, especially when it is expected that the remaining stock might fall substantially in price after the partial tender offer is completed. An example of a partial tender offer might help to establish the scenario.

Example: XYZ proposes to buy back part of its own stock. It has offered to pay \$70 per share for half the company. There are no plans to do anything further. Based on

the fundamentals of the company, it is expected that the remaining stock will sell for approximately $40 per share. Thus, the average share of XYZ is worth 55 if the tender offer is completed (one-half can be sold at 70, and the other half will be worth 40). XYZ stock might sell for $52 or $53 per share until the tender is completed. On the day after the tender offer expires, XYZ stock will drop immediately to the $40 per share level.

There are two ways to make money in this situation. One is to buy XYZ at the current price, say 52, and tender it. The remaining portion would be sold at the lower price, say 40, when XYZ reopened after the tender expired. This method would yield a profit of $3 per share if exactly 50% of the shares are accepted at 70 in the tender offer. In reality, a slightly higher percentage of shares is usually accepted, because a few people make mistakes and don't tender. Thus, one's average net price might be $56 per share, for a $4 profit from this method. The risk in this situation is that XYZ opens substantially below 40 after the tender at 70 is completed.

Theoretically, the other way to trade this tender offer might be to sell XYZ short at 52 and cover it at 40 when it reopens after the tender offer expires. Unfortunately, this method cannot be effected because there will not be any XYZ stock to borrow in order to sell it short. All owners will tender the stock rather than loan it to arbitrageurs. Arbitrageurs understand this, and they also understand the risk they take if they try to short stock at the last minute: They might be forced to buy back the stock for cash, or they may be forced to give the equivalent of $70 per share for half the stock to the person who bought the stock from them. For some reason, many individual investors believe that they can "get away" with this strategy. They short stock, figuring that their brokerage firm will find some way to borrow it for them. Unfortunately, this usually costs the customer a lot of money.

The use of calls does not provide a more viable way of attempting to capitalize on the drop of XYZ from 52 to 40. In-the-money call options on XYZ will normally be selling at parity just before the tender offer expires. If one sells the call as a substitute for the short sale, he will probably receive an assignment notice on the day after the tender offer expires, and therefore find himself with the same problems the short seller has.

The only safe way to play for this drop is to buy puts on XYZ. These puts will be very expensive. In fact, with XYZ at 52 before the tender offer expires, if the consensus opinion is that XYZ will trade at 40 after the offer expires, then puts with a 50 strike will sell for at least $10. This large price reflects the expected drop in price of XYZ. Thus, it is not beneficial to buy these puts as downside speculation unless one expects the stock to drop farther than to the $40 level. There is, however, an opportunity for arbitrage by buying XYZ stock and also buying the expensive puts.

Before giving an example of that arbitrage, a word about short tendering is in order. Short tendering is against the law. It comes about when one tenders stock into a tender offer when he does not really own that stock. There are complex definitions regarding what constitutes ownership of stock during a tender offer. One must be net long all the stock that he tenders on the day the tender offer expires. Thus, he cannot tender the stock on the day before the offer expires, and then short the stock on the next day (even if he could borrow the stock). In addition, one must subtract the number of shares covered by certain calls written against his position: Any calls with a strike price less than the tender offer price must be subtracted. Thus, if he is long 1,000 shares and has written 10 in-the-money calls, he cannot tender any shares. The novice and experienced investor alike must be aware of these definitions and should not violate the short tender rules.

Let us now look at an arbitrage consisting of buying stock and buying the expensive puts.

Example: XYZ is at 52. As before, there is a tender offer for half the stock at 70, with no plans for the remainder. The July 55 puts sell for 15, and the July 50 puts sell for 10. It is common that both puts would be predicting the same price in the after-market: 40.

If one buys 200 shares of XYZ at 52 and buys one July 50 put at 10, he has a locked-in profit as long as the tender offer is completed. He only buys one put because he is assuming that 100 shares will be accepted by the company and only 100 shares will be returned to him. Once the 100 shares have been returned, he can exercise the put to close out his position.

The following table summarizes these results:

Initial purchase	
Buy 200 XYZ at 52	$10,400 debit
Buy 1 July 50 put at 10	1,000 debit
Total Cost	$11,400 debit
Closing sale	
Sell 100 XYZ at 70 via tender	7,000 credit
Sell 100 XYZ at 50 via put exercise	5,000 credit
Total proceeds	$12,000 credit
Total profit: $600	

This strategy eliminates the risk of loss if XYZ opens substantially below 40 after the tender offer. The downside price is locked in by the puts.

If more than 50% of XYZ should be accepted in the tender offer, then a larger profit will result. Also, if XYZ should subsequently trade at a high enough price so that the July 50 put has some time value premium, then a larger profit would result as well. (The arbitrageur would not exercise the put, but would sell the stock and the put separately in that case.)

Partial tender offers can be quite varied. The type described in the above example is called a "two-tier" offer because the tender offer price is substantially different from the remaining price. In some partial tenders, the remainder of the stock is slated for purchase at substantially the same price, perhaps through a cash merger. The above strategy would not be applicable in that case, since such an offer would more closely resemble the "any and all" offer. In other types of partial tenders, debt securities of the acquiring company may be issued after the partial cash tender. The net price of these debt securities may be different from the tender offer price. If they are, the above strategy might work.

In summary, then, one should look at tender offers carefully. One should be careful not to take extraordinary option risk in an "any and all" tender. Conversely, one should look to take advantage of any "two-tier" situation in a partial tender offer by buying stock and buying puts.

PROFITABILITY

Since the potential profits in risk arbitrage situations may be quite large, perhaps 3 or 4 points per 100 shares, the public can participate in this strategy. Commission charges will make the risk arbitrage less profitable for a public customer than it would be for an arbitrageur. The profit potential is often large enough, however, to make this type of risk arbitrage viable even for the public customer.

In summary, the risk arbitrageur may be able to use options in his strategy, either as a replacement for the actual stock position or as protection for the stock position. Although the public cannot normally participate in arbitrage strategies because of the small profit potential, risk arbitrages may often offer exceptions. The profit potential can be large enough to overcome the commission burden for the public customer.

PAIRS TRADING

A stock trading strategy that has gained some adherents in recent years is pairs trading. Simplistically, this strategy involves trading pairs of stocks – one held long, the other short. Thus, it is a hedged strategy. The two stocks' price movements are related historically. The pairs trader would establish the position when one stock was

expensive with respect to the other one, historically. Then, when the stocks return to their historical relationship, a profit would result. In reality, some fairly complicated computer programs search out the appropriate pairs.

The interest on the short sale offsets the cost of carry of the stock purchased. Therefore, the pairs trader doesn't have any expense except the possible differential in dividend payout.

The bane of pairs trading is a possible escalation of the stock sold short without any corresponding rise in price of the stock held long. A takeover attempt might cause this to happen. Of course, pairs traders will attempt to research the situation to ensure that they don't often sell short stocks that are perceived to be takeover candidates.

Pairs traders can use options to potentially reduce their risk if there are in-the-money options on both stocks. One would buy an in-the-money put instead of selling one stock short, and would buy an in-the-money call on the other stock instead of buying the stock itself. In this option combination, traders are paying very little time value premium, so their profit potential is approximately the same as with the pairs trading strategy using stocks. (One would, however, have a debit, since both options are purchased; so there would be a cost of carry in the option strategy.)

If the stocks return to their historical relationship, the option strategy will reflect the same profit as the stock strategy, less any loss of time value premium. One added advantage of the option strategy, however, is that if a takeover occurs, the put has limited liability, and the trader's loss would be less.

Another advantage of the option strategy is that if both stocks should experience large moves, it could make money even if the pair doesn't return to historical norms. This would happen, for example, if both stocks dropped a great deal: The call has limited loss, while the put's profits would continue to accrue. Similarly, to the upside, a large move by both stocks would make the put worthless, but the call would keep making money. In both cases, the option strategy could profit even if the pair of stocks didn't perform as predicted.

This type of strategy – buying in-the-money options as substitutes for both sides of a spread or hedge strategy – is discussed in more detail in Chapter 31 on index spreading and Chapter 35 on futures spreads.

FACILITATION (BLOCK POSITIONING)

Facilitation is the process whereby a trader seeks to aid in making markets for the purchase or sale of large blocks of stock. This is not really an arbitrage, and its description is thus deferred to Chapter 28.

CHAPTER 28

Mathematical Applications

In previous chapters, many references have been made to the possibility of applying mathematical techniques to option strategies. Those techniques are developed in this chapter. Although the average investor – public, institutional, or floor trader – normally has a limited grasp of advanced mathematics, the information in this chapter should still prove useful. It will allow the investor to see what sorts of strategy decisions could be aided by the use of mathematics. It will allow the investor to evaluate techniques of an information service. Additionally, if the investor is contemplating hiring someone knowledgeable in mathematics to do work for him, the information to be presented may be useful as a focal point for the work. The investor who does have a knowledge of mathematics and also has access to a computer will be able to directly use the techniques in this chapter.

THE BLACK-SCHOLES MODEL

Since an option's price is the function of stock price, striking price, volatility, time to expiration, and short-term interest rates, *it is logical that a formula could be drawn up to calculate option prices* from these variables. Many models have been conceived since listed options began trading in 1973. Many of these have been attempts to improve on one of the first models introduced, the *Black–Scholes model.* This model was introduced in early 1973, very near the time when listed options began trading. It was made public at that time and, as a result, gained a rather large number of adherents. The formula is rather easy to use in that the equations are short and the number of variables is small.

The actual formula is:

$$\text{Theoretical option price} = pN(d_1) - se^{-rt}N(d_2)$$

$$\text{where } d_1 = \frac{\ln\left(\frac{p}{s}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$$

$$d_2 = d_1 - v\sqrt{t}$$

The variables are:

p = stock price
s = striking price
t = time remaining until expiration, expressed as a percent of a year
r = current risk-free interest rate
v = volatility measured by annual standard deviation
ln = natural logarithm
$N(x)$ = cumulative normal density function

An important by-product of the model is the exact calculation of the delta – that is, the amount by which the option price can be expected to change for a small change in the stock price. The delta was described in Chapter 3 on call buying, and is more formally known as the *hedge ratio.*

$$\text{Delta} = N(d_1)$$

The formula is so simple to use that it can fit quite easily on most programmable calculators. In fact, some of these calculators can be observed on the exchange floors as the more theoretical floor traders attempt to monitor the present value of option premiums. Of course, a computer can handle the calculations easily and with great speed. A large number of Black–Scholes computations can be performed in a very short period of time.

The cumulative normal distribution function can be found in tabular form in most statistical books. However, for computation purposes, it would be wasteful to repeatedly look up values in a table. Since the normal curve is a smooth curve (it is the "bell-shaped" curve used most commonly to describe population distributions), the cumulative distribution can be approximated by a formula:

$$x = 1 - z(1.330274y^5 - 1.821256y^4 + 1.781478y^3 - .356538y^2 + .3193815y)$$

$$\text{where } y = \frac{1}{1 + .2316419|\sigma|} \quad \textit{and} \quad z = .3989423e^{-\sigma^2/2}$$

$$\text{Then } N(\sigma) = x \text{ if } \sigma > 0 \quad \text{or} \quad N(\sigma) = 1 - x \text{ if } \sigma < 0$$

This approximation is quite accurate for option pricing purposes, since one is not really interested in thousandths of a point where option prices are concerned.

Example: Suppose that XYZ is trading at 45 and we are interested in evaluating the July 50 call, which has 60 days remaining until expiration. Furthermore, assume that the volatility of XYZ is 30% and that the risk-free interest rate is currently 10%. The theoretical value calculation is shown in detail, in order that those readers who wish to program the model will have something to compare their calculations against.

Initially, determine t, d_1, and d_2, by referring to the formulae on the previous page:

$$t = 60/365 = .16438 \text{ years}$$

$$d_1 = \frac{\ln(45/50) + (.1 + .3 \times .3/2) \times .16438}{.3 \times \sqrt{.16438}}$$

$$= \frac{-.10536 + (.145 \times .16438)}{.3 \times .40544} = -.67025$$

$$d_2 = -.67025 - .3\sqrt{.16438} = -.67025 - (.3 \times .40544) = -.79189$$

Now calculate the cumulative normal distribution function for d_1 and d_2 by referring to the above formulae:

$$d_1 = -.67025$$

$$y = \frac{1}{1 + (.2316419\,|-.67025|)} = \frac{1}{1.15526} = .86561$$

$$z = .3989423e^{-(-.67025 \times -.67025)/2}$$

$$= .3989423e^{-0.22462} = .31868$$

There are too many calculations involved in the computation of the fifth-order polynomial to display them here. Only the result is given:

$$x = .74865$$

Since we are determining the cumulative normal distribution of a negative number, the distribution is determined by subtracting x from 1.

$$N(d_1) = N(-.67025) = 1 - x = 1 - .74865 = .25134$$

In a similar manner, which requires computing new values for x, y, and z,

$$N(d_2) = N(-.79179) = 1 - .78579 = .21421$$

Now, returning to the formula for theoretical option price, we can complete the calculation of the July 50 call's theoretical value, called value here for short:

$$\begin{aligned} \text{value} &= 45 \times N(d_1) - 50 \times e^{-.1 \times .16438} \times N(d_2) \\ &= 45 \times .25134 - 50 \times .9837 \times .21421 \\ &= .7746 \end{aligned}$$

Thus, the theoretical value of the July 50 call is just slightly over 3/4 of a point. Note that the delta of the call was calculated along the way as $N(d_1)$ and is equal to just over .25. That is, the July 50 call will change price about 1/4 as fast as the stock for a small price change by the stock.

This example should answer many of the questions that readers of the first edition have posed. The reader interested in a more in-depth description of the model, possibly including the actual derivation, should refer to the article "Fact and Fantasy in the Use of Options."[1] One of the less obvious relationships in the model is that call option prices will increase (and put option prices will decrease) as the risk-free interest rate increases. It may also be observed that the model correctly preserves relationships such as increased volatility, higher stock prices, or more time to expiration, which all imply higher option prices.

CHARACTERISTICS OF THE MODEL

Several aspects of this model are worth further discussion. First, the reader will notice that *the model does not include dividends paid by the common stock.* As has been demonstrated, dividends act as a negative effect on call prices. Thus, direct application of the model will tend to give inflated call prices, especially on stocks that pay relatively large dividends. There are ways of handling this. Fisher Black, one of the coauthors of the model, suggested the following method: Adjust the stock price to be used in the formula by subtracting, from the current stock price, the present worth of the dividends likely to be paid before maturity. Then calculate the option price. Second, assume that the option expires just prior to the last ex-dividend date preceding actual option expiration. Again adjust the stock price and calculate the option price. Use the higher of the two option prices calculated as the theoretical price.

Another, less exact, method is to apply a weighting factor to call prices. The weighting factor would be based on the dividend payment, with a heavier weight being applied to call options on high-yielding stock. It should be pointed out that, in

[1]Fisher Black, *Financial Analysts Journal,* July–August 1975, pp. 36–70.

many of the applications that are going to be prescribed, it is not necessary to know the exact theoretical price of the call. Therefore, the dividend "correction" might not have to be applied for certain strategy decisions.

The model is based on a lognormal distribution of stock prices. Even though the normal distribution is part of the model, the inclusion of the exponential functions makes the distribution lognormal. For those less familiar with statistics, a normal distribution has a bell-shaped curve. This is the most familiar mathematical distribution. The problem with using a normal distribution is that it allows for negative stock prices, an impossible occurrence. Therefore, the lognormal distribution is generally used for stock prices, because it implies that the stock price can have a range only between zero and infinity. Furthermore, the upward (bullish) bias of the lognormal distribution appears to be logically correct, since a stock can drop only 100% but can rise in price by more than 100%. Many option pricing models that antedate the Black–Scholes model have attempted to use empirical distributions. An empirical distribution has a different shape than either the normal or the lognormal distribution. Reasonable empirical distributions for stock prices do not differ tremendously from the lognormal distribution, although they often assume that a stock has a greater probability of remaining stable than does the lognormal distribution. Critics of the Black–Scholes model claim that, largely because it uses the lognormal distribution, the model tends to overprice in-the-money calls and underprice out-of-the-money calls. This criticism is true in some cases, but does not materially subtract from many applications of the model in strategy decisions. True, if one is going to buy or sell calls solely on the basis of their computed value, this would create a large problem. However, if strategy decisions are to be made based on other factors that outweigh the overpriced/underpriced criteria, small differentials will not matter.

The computation of volatility is always a difficult problem for mathematical application. In the Black–Scholes model, volatility is defined as the annual standard deviation of the stock price. This is the regular statistical definition of standard deviation:

$$\sigma^2 = \frac{\sum_{i=1}^{n} (P_i - P)^2}{n - 1}$$

$$v = \sigma/P$$

where

P = average stock price of all P_i's

P_i = daily stock price

n = number of days observed
v = volatility

When volatility is computed using past stock prices, it is called a historical volatility. *The volatilities of stocks tend to change over time.* Certain predictable factors, such as a large stock split increasing the float of the stock, can reduce the volatility. The entry of a company into a more speculative area of business may increase the volatility. Other, less well-defined factors can alter the volatility as well. Since the volatility is a very crucial element of the pricing model, it is important that the modeler use a reasonable estimate of the current volatility. *It has become apparent that an annual standard deviation is not accurate, because it encompasses too long a period of time.* Recent efforts by many modelers have suggested that one should perhaps weight the recent stock price action more heavily than older price action in arriving at a current volatility. This is a possible approach, but the computation of such factors may introduce as much error as using the annual standard deviation does. The problem of accurately computing the volatility is critical, because the model is so sensitive to it.

Computing Lognormal Historical Volatility. The above calculation does not give the proper input for the Black–Scholes model because the model assumes that the *logarithms* of changes in price are normally distributed, not the prices themselves. That is, the term P_i in the above formula should be changed.

Example: XYZ closed at 51 today and at 50 yesterday. Thus, its percentage change for the day is 51/50 = 1.02. The natural logarithm of 1.02 is then based on the volatility formula:

$$\ln(51/50) = \ln(1.02) = 0.0198$$

This is similar to saying that arithmetically the stock was up 2% today, but on a lognormal basis, it was only up 1.98%

If the stock is down, this method will yield a negative number. Suppose that on the following day, XYZ declined from 51 back to 50. The number to use in the volatility formula would then be:

$$\ln(50/51) = \ln(0.9804) = -0.0198$$

A new equation can now be formulated using this concept. It will yield volatilities that are consistent with the Black–Scholes model:

$$v = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \overline{X})^2}{n - 1}}$$

where $X_i = \ln(P_i/P_{i-1})$; P_i = closing price on day i and $\overline{X}$ = the average of the X_i's over the desired number of days.

So to compute a 10-day historical volatility, one would need 11 observations. In the following example, do not be concerned with the complete details if you do not plan to compute the volatilities yourself; they are provided for the mathematician or programmer who needs to check his work:

Day	XYZ Stock	P_i/P_{i-1}	$X_i = \ln(P_i/P_{i-1})$	$(X_i - X)^2$
1	153.875			
2	153.625	.9984	–.0016	.000020
3	151	.9829	–.0172	.000405
4	146	.9669	–.0337	.001336
5	144.125	.9872	–.0129	.000250
6	147.25	1.0217	.0215	.000345
7	146.25	.9932	–.0068	.000094
8	149.5	1.0222	.0220	.000365
9	152.5	1.0201	.0199	.000289
10	158.625	1.0402	.0394	.001332
11	158.375	0.9984	–.0016	.000020
			AVG: 0.0028825	Σ: 0.004455

The average of the lns (4th column) over the 10 days is 0.00288.

The difference of each ln from the mean, squared, is then summed (5th column). For example, for day 1 the term is $(-.0016 - .00288)^2 = .00002$. This is the top number in the far right-hand column. This process can be computed for each number in the "ln" column. The sum of all these terms is 0.004455.

$$\text{Now } v = \sqrt{(.004455/9)} = 0.022249$$

This is a 10-day volatility. To convert it into an annual volatility, we need to multiply by the square root of the number of trading days in a year. Since there are approximately 260 trading days in a year, the final volatility would be:

$$v = 0.022249 \times \sqrt{(260)} = 0.3587$$

Thus, one could say that the volatility of XYZ is 36% on an annualized basis.

This is then the proper way to calculate historical volatility. Obviously, the strategist can calculate 10-, 20-, and 50-day and annual volatilities if he wishes – or any other number for that matter. In certain cases, one can discern valuable information about a stock or future and its options by seeing how the various volatilities compare with one another.

There is, in fact, a way in which *the strategist can let the market compute the volatility for him.* This is called using the *implied volatility;* that is, the volatility that the market itself is implying. This concept makes the assumption that, for options with striking prices close to the current stock price and for options with relatively large trading volume, the market is fairly priced. This is something like an efficient market hypothesis. If there is enough trading interest in an option that is close to the money, that option will generally be fairly priced. Once this assumption has been made, a corollary arises: *If the actual price of an option is the fair price, it can be fixed in the Black–Scholes equation while letting volatility be the unknown variable.* The volatility can be determined by iteration. In fact, this process of iterating to compute the volatility can be done for each option on a particular underlying stock. This might result in several different volatilities for the stock. If one weights these various results by volume of trading and by distance in- or out-of-the-money, a single volatility can be derived for the underlying stock. This volatility is based on the closing price of all the options on the underlying stock for that given day.

Example: XYZ is at 33 and the closing prices are given in Table 28-1. Each option has a different implied volatility, as computed by determining what volatility in the Black–Scholes model would result in the closing price for each option: That is, if .34 were used as the volatility, the model would give 4½ as the price of the January 30 call. In order to rationally combine these volatilities, weighting factors must be applied before a volatility for XYZ stock itself can be arrived at.

The weighting factors for volume are easy to compute. The factor for each option is merely that option's daily volume divided by the total option volume on all XYZ options (Table 28-2). The weighting functions for distance from the striking price should probably not be linear. For example, if one option is 2 points out-of-the-money and another is 4 points out-of-the-money, the former option should not necessarily get twice as much weight as the latter. Once an option is too far in- or out-of-the-money, it should not be given much or any weight at all, regardless of its trading volume. Any parabolic function of the following form should suffice:

$$\text{Weighting factor}\begin{cases} = \dfrac{(x-a)^2}{a^2} & \text{if } x \text{ is less than } a \\ = 0 & \text{if } x \text{ is greater than } a \end{cases}$$

TABLE 28-1.
Implied volatilities, closing price, and volume.

Option	Option Price	Volume	Implied Volatility
January 30	$4^1/_2$	50	.34
January 35	$1^1/_2$	90	.28
April 35	$2^1/_2$	55	.30
April 40	$1^1/_2$	5	.38
		200	

TABLE 28-2.
Volume weighting factors.

Option	Volume	Volume Weighting Factor
January 30	50	.25 (50/200)
January 35	90	.45 (90/200)
April 35	55	.275 (55/200)
April 40	5	.025 (5/200)

where x is the percentage distance between stock price and strike price and a is the maximum percentage distance at which the modeler wants to give any weight at all to the option's implied volatility.

Example: An investor decides that he wants to discard options from the weighting criterion that have striking prices more than 25% from the current stock price. The variable, a, would then be equal to .25. The weighting factors, with XYZ at 33, could thus be computed as shown in Table 28-3. To combine the weighting factors for both volume and distance from strike, the two factors are multiplied by the implied volatility for that option. These products are summed up for all the options in question. This sum is then divided by the products of the weighting factors, summed over all the options in question. As a formula, this would read:

$$\text{Implied volatility} = \frac{\Sigma(\text{Volume factor} \times \text{Distance factor} \times \text{Implied volatility})}{\Sigma(\text{Volume factor} \times \text{Distance factor})}$$

In our example, this would give an implied volatility for XYZ stock of 29.8% (Table 28-4). Note that the implied volatility, .298, is not equal to any of the individ-

TABLE 28-3.
Distance weighting factors.

Option	Distance from Stock Price	Distance Weighting Factor
January 30	.091 (3/33)	.41
January 35	.061 (2/33)	.57
April 35	.061 (2/33)	.57
April 40	.212 (7/33)	.02

TABLE 28-4.
Option's implied volatility.

Option	Volume Factor	Distance Factor	Option's Implied Volatility
January 30	.25	.41	.34
January 35	.45	.57	.28
April 35	.275	.57	.30
April 40	.025	.02	.38

$$\text{Implied volatility} = \frac{.25 \times .41 \times .34 + .45 \times .57 \times .28 + .275 \times .57 \times .30 + .025 \times .02 \times .38}{.25 \times .41 + .45 \times .57 + .275 \times .57 + .025 \times .02}$$

$$= .298$$

ual option's implied volatilities. Rather, it is a composite figure that gives the most weight to the heavily traded, near-the-money options, and very little weight to the lightly-traded (5 contracts), deeply out-of-the-money April 40 call. This implied volatility is still a form of standard deviation, and can thus be used whenever a standard deviation volatility is called for.

This method of computing volatility is quite accurate and proves to be sensitive to changes in the volatility of a stock. For example, as markets become bullish or bearish (generating large rallies or declines), most stocks will react in a volatile manner as well. Option premiums expand rather quickly, and this method of implied volatility is able to pick up the change quickly. One last bit of fine-tuning needs to be done before the final volatility of the stock is arrived at. On a day-to-day basis, the implied volatility for a stock – especially one whose options are not too active – may fluctuate more than the strategist would like. A smoothing effect can be obtained by

taking a moving average of the last 20 or 30 days' implied volatilities. An alternative that does not require the saving of many previous days' worth of data is to use a momentum calculation on the implied volatility. For example, today's final volatility might be computed by adding 5% of today's implied volatility to 95% of yesterday's final volatility. This method requires saving only one previous piece of data – yesterday's final volatility – and still preserves a "smoothing" effect.

Once this implied volatility has been computed, it can then be used in the Black–Scholes model (or any other model) as the volatility variable. Thus one could compute the theoretical value of each option according to the Black–Scholes formula, utilizing the implied volatility for the stock. Since the implied volatility for the stock will most likely be somewhat different from the implied volatility of this particular option, there will be a discrepancy between the option's actual closing price and the theoretical price as computed by the model. This differential represents the amount by which the option is theoretically overpriced or underpriced, *compared to other options on that same stock.*

EXPECTED RETURN

Certain investors will enter positions only when the historical percentages are on their side. When one enters into a transaction, he normally has a belief as to the possibility of making a profit. For example, when he buys stock he may think that there is a "good chance" that there will be a rally or that earnings will increase. The investor may consciously or unconsciously evaluate the probabilities, but invariably, an investment is made based on a positive expectation of profit. Since options have fixed terms, they lend themselves to a more rigorous computation of expected profit than the aforementioned intuitive appraisal. This more rigorous approach consists of computing the expected return. *The expected return is nothing more than the return that the position should yield over a large number of cases.*

A simple example may help to explain the concept. The crucial variable in computing expected return is to outline what the chances are of the stock being at a certain price at some future time.

Example: XYZ is selling at 33, and an investor is interested in determining where XYZ will be in 6 months. Assume that there is a 20% chance of XYZ being below 30 in 6 months, and that there is a 40% chance that XYZ will be above 35 in 6 months. Finally, assume that XYZ has an equal 10% chance of being at 31, 32, 33, or 34 in 6 months. All other prices are ignored for simplification. Table 28-5 summarizes these assumptions.

TABLE 28-5.
Calculation of expected returns.

Price of XYZ in 6 Months	Chance of XYZ Being at That Price
Below 30	20%
31	10%
32	10%
33	10%
34	10%
Above 35	40%
	100%

Since the percentages total 100%, all the outcomes have theoretically been allowed for. Now suppose a February 30 call is trading at 4 and a February 35 call is trading at 2 points. A bull spread could be established by buying the February 30 and selling the February 35. This position would cost 2 points – that is, it is a 2-point debit. The spreader could make 3 points if XYZ were above 35 at expiration for a return of 150%, or he could lose 100% if XYZ were below 30 at expiration. The expected return for this spread can be computed by multiplying the outcome at expiration for each price by the probability of being at that price, and then summing the results. For example, if XYZ is below 30 at expiration, the spreader loses $200. It was assumed that there is a 20% chance of XYZ being below 30 at expiration, so the expected loss is 20% times $200, or $40. Table 28-6 shows the computation of the expected results at all the prices. The total expected profit is $100. This means that the expected return (profit divided by investment) is 50% ($100/$200). This appears to be an attractive spread, because the spreader could "expect" to make 50% of his money, less commissions.

What has really been calculated in this example is merely *the return that one would expect to make in the long run if he invested in the same position many times throughout history.* Saying that a particular position has an expected return of 8 or 9% is no different from saying that common stocks return 8 or 9% in the long run. Of course, in bull markets stock would do much better, and in bear markets much worse. In a similar manner, this example bull spread with an expected return of 50% may do as well as the maximum profit or as poorly as losing 100% in any one case. It is the total return on many cases that has the expected return of 50%. *Mathematical theory holds that, if one constantly invests in positions with positive expected returns, he should have a better chance of making money.*

TABLE 28-6.
Computation of expected profit.

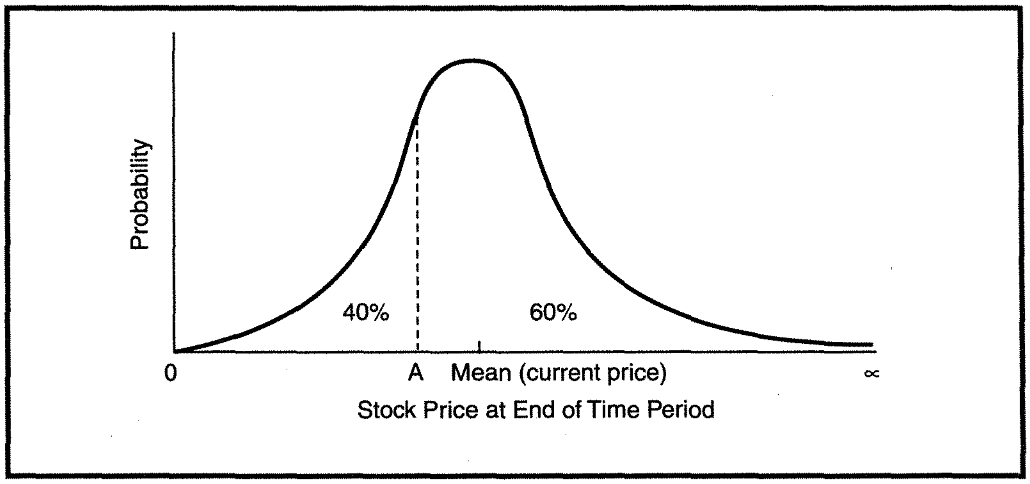
XYZ Price at Expiration	Chance of Being at That Price (A)	Profit at That Price (B)	Expected Profit: (A) × (B)
Below 30	20%	–$200	–$ 40
31	10%	– 100	– 10
32	10%	0	0
33	10%	+ 100	+ 10
34	10%	+ 200	+ 20
Above 35	40%	+ 300	+ 120
		Total expected profit	$100

As is readily observable, the selection of what percentages to assign to the possible outcomes in the stock price is a crucial choice. In the example above, if one altered his assumption slightly so that XYZ had a 30% chance of being below 30 and a 30% chance of being above 35 at expiration, the expected return would drop considerably, to 25%. Thus, *it is important to have a reasonably accurate and consistent method of assigning these percentages.* Furthermore, the example above was too simplistic, in that it did not allow for the stock to close at any fractional prices, such as 32½. A correct expected return computation must take into account all possible outcomes for the stock.

Fortunately, there is a straightforward method of computing the expected percentage chance of a given stock being at a certain price at a certain point in time. This computation involves using the distribution of stock prices. As mentioned earlier, the Black–Scholes model assumes a lognormal distribution for stock prices, although many modelers today use nonstandard (empirical or heuristic) distributions. No matter what the distribution, *the area under the distribution curve between any two points gives the probability of being between those two points.*

Figure 28-1 is a graph of a typical lognormal distribution. The peak always lies at the "mean," or average, of the distribution. For stock price distributions, under the random walk assumption, *the "mean" is generally considered to be the current stock price.* The graph allows one to visualize the probability of being at any given price. Note that there is a fairly great chance that the stock will be relatively unchanged; there is no chance that the stock will be below zero; and there is a bullish bias to the graph – the stock could rise infinitely, although the chances of it doing so are extremely small.

FIGURE 28-1.
Typical lognormal distribution.



The chance that XYZ will be below the mean at the end of the time period is 50% in a random walk distribution. This also means that 50% of the area under the graph lies to the left of the mean and 50% lies to the right of the mean. Note point A on the graph. Forty percent of the area under the distribution curve lies to the left of point A and 60% lies to the right of it. This means that there is a 40% chance that the stock will be below price A at the end of the time period and a 60% chance that the stock will be above price A. Consequently, the distribution curve can be used to determine the probabilities necessary for the expected return computation. The reader should take note of the fact that these probabilities apply to the *end of the time period.* They say nothing about the chances that XYZ might dip below price A at some time *during* the time period. To compute that percentage, an involved computation is necessary.

The height and width of the distribution graph are determined by the volatility of the underlying stock, when volatility is expressed as a standard deviation. This is consistent with the method of computing volatility described earlier in this chapter. Implied volatility can, of course, be used. Since the option modeler is generally interested in time periods other than one year, *the annual volatility must be converted into a volatility for the time period in question.* This is easily accomplished by the following formula:

$$v_t = v\sqrt{t}$$

where

v = annual volatility

t = time, in years

v_t = volatility for time, t.

As an example, a 3-month volatility would be equal to one-half of the annual volatility. In this case, t would equal .25 (one fourth of a year), so $v_{.25} = v\sqrt{.25} = .5v$.

The necessary groundwork has been laid for the computation of the probability necessary in the expected return calculation. The following formula gives the probability of a stock that is currently at price p being below some other price, q, at the end of the time period. The lognormal distribution is assumed.

Probability of stock being below price q at end of time period t:

$$P\text{ (below)} = N\left(\frac{\ln\left(\frac{q}{p}\right)}{v_t}\right)$$

where

N = cumulative normal distribution

p = current price of the stock

q = price in question

ln = natural logarithm for the time period in question.

If one is interested in computing the probability of the stock being *above* the given price, the formula is

$$P\text{ (above)} = 1 - P\text{ (below)}$$

With this formula, the computation of expected return is quickly accomplished with a computer. One merely has to start at some price – the lower strike in a bull spread, for example – and work his way up to a higher price – the high strike for a bull spread. At each price point in between, the outcome of the spread is multiplied by the probability of being at that price, and a running sum is kept.

Simplistically, the following iterative equation would be used.

$$P\text{ (of being at price } x) = P\text{ (below } x) - P\text{ (below } y)$$

where y is close to but less than x in price. As an example:

$$P\text{ (of being at 32.4)} = P\text{ (below 32.4)} - P\text{ (below 32.3)}$$

Thus, once the low starting point is chosen and the probability of being below that price is determined, one can compute the probability of being at prices that are successively higher merely by iterating with the preceding formula. In reality, *one is using this information to integrate the distribution curve.* Any method of approximating the integral that is used in basic calculus, such as the Trapezoidal Rule or Simpson's Rule, would be applicable here for more accurate results, if they are desired.

A partial example of an expected return calculation follows.

Example: XYZ is currently at 33 and has an annual volatility of 25%. The previous bull spread is being established – buy the February 30 and sell the February 35 for a 2-point debit – and these are 6-month options. Table 28-7 gives the necessary components for computing the expected return. Column (A), the probability of being below price q, is computed according to the previously given formula, where $p = 33$ and $v_t = .177$ ($_t = .25\sqrt{1/2}$). The first stock price that needs to be looked at is 30, since all results for the bull spread are equal below that price – a 100% loss on the spread. The calculations would be performed for each eighth (or tenth) of a point up through a price of 35. The expected return is computed by multiplying the two right-hand columns, (B) and (C), and summing the results. Note that column (B) is determined by subtracting successive numbers in column (A). It would not be particularly enlightening to carry this example to completion, since the rest of the computations are similar and there is a large number of them.

In theory, if one had the data and the computer power, he could evaluate a wide range of strategies every day and come up with the best positions on an expected return basis. He would probably get a few option buys (puts or calls), some bull

TABLE 28-7.
Calculation of expected returns.

Price at Expiration (q)	(A) P (below q)	(B) P (of being at q)	(C) Profit on Spread
30	.295	.295	–$200
$30^1/_8$	.301	.006	– 187.50
$30^1/_4$	.308	.007	– 175
$30^3/_8$	.316	.008	– 162.50
.	.	.	.
.	.	.	.
.	.	.	.

spreads, some naked writes and ratio calendar spreads, fewer straddles and ratio writes, and a few covered call writes. This theory would be somewhat difficult to apply in practice, because of the massive numbers of calculations involved and also because of the accuracy of closing price data. It was mentioned previously that a computer will assume that "bad" closing prices are actually attainable. By a "bad" closing price, it is meant that the option did not trade simultaneously with the stock later in the day, and that the actual market for the option is somewhat different in price than is reflected by the closing price for the option. A daily contract volume "screen" will help alleviate this problem. For example, one may want to discard any option from his calculations if that option did not trade a predetermined, minimum number of contracts during the previous day. Data that give closing bids and offers for each option are more expensive but also more reliable, and would alleviate the problem of "bad" closing prices. In addition to a volume screen, another way of reducing the calculations required is to limit oneself to strategies in which one has interest, or which one is reasonably certain will fit in well with his investment objectives. Regardless of the limitations that one places upon the quantity of computations, some computer power is necessary to compute expected return. A sophisticated programmable calculator may be able to provide a real-time calculation, but could never be used to evaluate the entire option universe and come up with a ranking of the preferable situations each day. On-line computer systems are also available that can provide these types of calculations using up-to-the-minute prices. While real-time prices may occasionally be useful, it is not an absolute necessity to have them.

One other by-product of the expected return calculation is that it could be used as another model for predicting the theoretical value of an option. All one would have to do is compute the probabilities of the stock being at each successive price above the striking price of the option by expiration, and sum them up. The result would be the theoretical option value. These data are published by some services and generally give a different theoretical value than would the Black–Scholes model. The reason for the difference most readily lies in the inclusion of the risk-free interest rate in the Black–Scholes model and its omission in the expected return model.

APPLYING THE CALCULATIONS TO STRATEGY DECISIONS

CALL WRITING

One method of ranking covered call writes that was described in Chapter 2 was to rank all the writes that provided at least a minimal acceptable level of return by their probability of not losing money. If one were interested in safety, he might decide to use this approach. Suppose he decided that he would consider any write that provid-

ed an annualized total return (capital gains, dividends, and commissions) of at least 12%. This would eliminate many potential writes, but would leave him with a fairly large number of writing candidates each day. He knows the downside break-even point at expiration in each write. Therefore, the probability of the stock being below that break-even point at expiration can be computed quickly. His final list would *rank those writes with the least chance of being below the break-even point at expiration as the best writes.* Again, this ranking is based on an expected probability and is, of course, no guarantee that the stock will not, in reality, fall below the break-even point. However, over time, *a list of this sort should provide the most conservative covered writes.*

Example: XYZ is selling for 43 and a 6-month July 40 call is selling for 8 points. After including dividends and commission costs for a 500-share position, the downside break-even point at expiration is 36. If the annualized volatility of XYZ is 25%, the probability of making money at expiration can be computed. The 6-month volatility is 17.7% (25% times the square root of ½ year). The probability of being below 36 can be computed by using the formula given earlier in this section:

$$P\text{ (below 36 in 6 months)} = N\left(\frac{\ln\left(\frac{36}{43}\right)}{.177}\right) = N\left(\frac{-.178}{.177}\right) = 0.158$$

The expected probability of XYZ being below 36 in 6 months is 15.8%. Therefore, this would be an attractive write on a conservative basis, because it has a large probability of making money (nearly 85% chance of not being below the break-even point at expiration). The return if exercised in this example is approximately 20% annualized, so it should be acceptable from a profit potential viewpoint as well. It is a relatively easy matter to perform a similar calculation, with the aid of a computer, on all covered writing candidates.

The ability to measure downside protection in terms of a common denominator – volatility – can be useful in other types of covered call writing analyses. The writer interested in writing out-of-the-money calls, which generally have higher profit potential, is still interested in having an idea of what his downside protection is. He might, for example, decide that he wants to invest in situations in which the probability of making money is at least 60%. This is not an unusually difficult requirement to fulfill, and will leave many attractive covered writes with a high profit potential to choose from. A downside requirement stated in terms of probability of success removes the necessity of having to impose arbitrary requirements. Typical

arbitrary requirements would be including only calls that sell for one point or more, or stating that the downside protection must be a certain percentage of the stock price. These obviously cannot suffice for stocks with different volatilities. Rather, the downside protection criterion should be stated in terms of "probability of down protection" or, alternatively, in terms of the volatility itself. In this manner, a uniform comparison can be made between volatile and nonvolatile stocks.

CALL BUYING

The option buyer can also constructively use the measurement of volatility to aid him in his option buying decisions. In Chapter 3, it was shown that *evaluating the profitability of calls based on the volatility of the underlying stock is the correct way to analyze an option purchase.* One specific method of analysis is described. There are certain variables in this analysis that may be altered to fit the call buyer's individual preferences, but the general logic is applicable to all cases.

As a first step, *one should decide upon a uniform stock movement for ranking call purchases.* One might decide to rank all purchases by how they would perform if the underlying stock moved up in accordance with its volatility. The phrase "in accordance with its volatility" must be quantified. For example, one might decide to assume that every stock could move up one standard deviation, and then rank all call purchases on that basis. *The prospective call buyer must also fix the time period that he wants to use.* Generally, one looks at purchases to be held for 30 days, 60 days, and 90 days.

The exact steps to be followed in the analysis of profitability and risk can be listed as follows:

1. Specify the distance that underlying stock can move, up or down, in terms of its volatility.
2. Select the holding period over which the analysis is to take place.

PROFITABILITY

3. Calculate the stock price that the stock would move up to, when the foregoing assumptions are implemented.
4. Using a pricing model, such as the Black–Scholes model, estimate what the option price would become after the upward stock movement.
5. Calculate the percent profit, after deducting commissions.
6. Repeat steps 4 and 5 for each option on the stock.

A final ranking of all potential call buys can be obtained by performing steps 3 through 6 on all stocks, and ranking the purchases by their percentage reward.

RISK

7. Calculate the stock price that the stock could fall to, when the assumptions in steps 1 and 2 are applied.
8. With a model, price the option after the stock's decline.
9. Calculate the percentage loss after commissions.
10. Compute a reward/risk ratio: Divide the percentage profit from step 5 by the percentage risk from step 9.
11. Repeat steps 8 through 10 for each option on the stock.

A final ranking of less aggressive option purchases can be constructed by performing steps 7 through 11 on all stocks, and ranking the purchases by their reward/risk ratio.

The higher profitability list of option purchases will tend to be at- or slightly out-of-the-money calls. The less aggressive list, ranked by reward/risk potential, will tend to be in-the-money options.

Example: Steps 1 and 2: Suppose an investor wants to look at option purchases for a 90-day holding period, under the assumption that each stock could move up by one standard deviation in that time. (There is only about a 16% chance that a stock will move more than one standard deviation in one direction in a given time period. Therefore, in actual practice, one might want to use a smaller stock movement in his ranking calculations.) Furthermore, assume that the following data are known:

XYZ common, 41;

XYZ volatility, 30% annually;

XYZ January 40 call, 4; and

time to January expiration, 6 months

Step 3: Calculate upward stock potential. This is accomplished by the following formula:

$$q = pe^{av_t}$$

where

p = current stock price

q = potential stock price

v_t = volatility for the time period, t
a = a constant (see below).

The constants, a and t, are fixed under the assumptions in steps 1 and 2. The first constant, a, is the number of standard deviations of movement to be allowed. In our example, $a = 1$. That is, the analysis is being made under the assumption that the stock could move up by one standard deviation. The second constant, t, is .25, since the analysis is for a 90-day holding period, which is 25% of a year. In this example:

$$v_t = v\sqrt{t} = .30\sqrt{.25} = .30 \times .50 = .15$$

so

$$q = 41e^{.15} = 41 \times 1.16 = 47.64$$

Thus, this stock would move up to approximately 47⅝ if it moved one standard deviation in exactly 90 days.

Step 4: Using the Black–Scholes model, the XYZ January 40 call can be priced. It would be worth approximately 8⅛ if XYZ were at 47⅝ and there were 90 days' less life in the call.

Step 5: Calculate the profit potential. For this example, commissions will be ignored, but they should be included in a real-life situation.

$$\text{Percent profit} = \frac{8\frac{1}{8} - 4}{4} = \frac{4\frac{1}{8}}{4} = 103\%$$

Thus, if XYZ stock moves up by one standard deviation over the next 90 days, this call would yield a projected profit of 103%. Recall again that there is only about a 16% chance of the stock actually moving at least this far. If all options on all stocks are ranked under this same assumption, however, a fair comparison of profitable options will be obtained.

Step 6 is omitted from this example. It would consist of performing a similar profit analysis (steps 4 and 5) on all other XYZ options, with the assumption that XYZ is at 47⅝ after 90 days.

Step 7: Calculate the downside potential of XYZ. The formula for the downside potential of the stock is nearly the same as that used in step 3 for the upside potential:

$$\begin{aligned} q &= pe^{-av_t} \\ &= 41e^{-.15} = 41 \times .86 = 35.39 \end{aligned}$$

XYZ would fall to approximately 35¼ in 90 days if it fell by one standard deviation. Note that the actual distances that XYZ could rise and fall are not the same. The

upward potential was $6^5/_8$ points, while the downward potential is about $5^3/_4$ points. This difference is due to the use of the lognormal distribution.

Step 8: Using the Black–Scholes model, one could estimate that the XYZ January 40 call would be worth about $1^1/_8$ if XYZ were at $35^1/_4$ in 90 days.

Step 9: The risk potential in the January 40 call would be:

$$\text{Percent risk} = \frac{4 - 1^1/_8}{4} = \frac{2^7/_8}{4} = 72\%$$

Step 10: The reward/risk ratio is merely the percentage reward divided by the percentage risk:

$$\text{Reward/risk ratio} = \frac{103\%}{72\%} = 1.43$$

Step 11: This analysis would be repeated for all XYZ options, and then for all other optionable stocks. The less aggressive call purchases would be ranked by their reward/risk ratios, with higher ratios representing more attractive purchases. More aggressive purchases would be ranked by the potential rewards only (step 5).

This completes the call buying example. Before leaving this section, it should be noted that the assumption of ranking the purchases after one full standard deviation movement by the underlying stock is probably excessive. A more moderate assumption would be that the stock might be able to move .7 standard deviation. There is about a 25% expected chance that a stock could move up at least .7 standard deviation at the end of a fixed time period.

PRICING A PUT OPTION

Theoretical models for pricing put options have been derived; that is, ones that are separate from call pricing models. Black and Scholes presented such a model in their original paper. However, as has been demonstrated, there is a relationship between put and call prices in the listed option market due to the conversion and reversal strategies.

One could use the basic call pricing model for the purpose of predicting put prices if he assumes that arbitrageurs will efficiently influence the market via conversions. Theoreticians will argue that such a method of pricing puts assumes that the arbitrage process is always present and works efficiently, and that this is not true. The "conversion efficiency" assumption could be a serious fault if one were trying to determine the exact overpriced or underpriced nature of the put option. However, if one is merely comparing various put strategies under constant assumptions, the arbitrage model for pricing puts works quite well.

The listed put's price can be estimated by using the call pricing model and the arbitrage formula. Recall that the arbitrageur must include the cost of carrying the position as well as the dividends to be received.

$$\text{Theoretical put} = \text{Theoretical call price} + \text{Strike price} - \text{Stock price} - \text{Carrying cost} + \text{Dividends}$$

The "theoretical call price" is obtained from the Black–Scholes model. The carrying cost is the cost of money (interest rate) times the striking price, multiplied by the time to expiration. Recall that this is the approximation formula for carrying cost (see Chapter 27 for comments on present value and compounding). Consequently, if XYZ were at 41 and a 6-month January 40 call option were valued at 4 points by the Black–Scholes model, the theoretical put price could be estimated. Assume that the cost of money interest rate is 10% annually, and that the stock will pay \$.50 in dividends in 6 months ($t = 1/2$ year).

$$\begin{aligned}\text{Theoretical put price} &= 4 + 40 - 41 - (.10 \times 40 \times 1/2) + .50\\ &= 3 - 2 + 1/2\\ &= 1\tfrac{1}{2}\end{aligned}$$

This means that if the call could be sold for 4 points, the arbitrageur would be willing to pay up to 1½ points for the put to establish a conversion. The arbitrageur's price is used as the theoretical listed put price estimate.

PUT BUYING

Put option purchases can be ranked in a manner very similar to that described for call option buying. Reward opportunities occur when the stock falls in accordance with its volatility. An upward stock movement represents risk for the put buyer. All of the 11 steps in the previous section on call buying are applicable to put buying. The pricing of the put necessary for steps 4 and 8 is done in accordance with the arbitrage model just presented.

If an underlying stock does not have listed puts trading, the synthetic put can be considered. While all U.S.-listed stocks have both puts and calls at every strike, there are still situations with warrants, especially in foreign countries, that are applicable to the following discussion. Recall that synthetic puts are created for customers by some brokerage houses. The brokerage sells the stock short and buys a call. The customer can purchase the synthetic put for the amount of the risk involved, plus any dividends to be paid by the underlying stock. The synthetic put pricing formula that would be used in steps 4 and 8 of the option buying analysis is exactly the same as the arbitrage model for listed puts, except that the carrying costs are omitted:

$$\text{Theoretical synthetic put price} = \text{Theoretical call price} + \text{Strike price} - \text{Stock price} + \text{Dividends}$$

When the ranking analysis is performed, very few synthetic puts will appear as attractive put buys. This is because, when the customer buys a synthetic put, he must advance the full cost of the dividend, but receives no offsetting cost reduction for the credit being earned by the short stock position. Consequently, synthetic puts are always more expensive, on a relative basis, than are listed puts. However, if one is particularly bearish on a stock that has no listed puts, a synthetic put may still prove to be a worthwhile investment. The recommended analysis can give him a feeling for the reward and risk potential of the investment.

CALENDAR SPREADS

The pricing model can help in determining which neutral calendar spreads are most attractive. Recall that in a neutral calendar spread, one is selling a near-term call and buying a longer-term call, when the stock is relatively close to the striking price of the calls. The object of the spread is to capture the time decay differential between the two options. The neutral calendar spread is normally closed when the near-term option expires. The pricing model can aid the spreader by estimating what the profit potential of the spread is, as well as helping in the determination of the break-even points of the position at near-term expiration.

To determine the maximum profit potential of the spread, assume that the near-term call expires worthless and use the pricing model to estimate the value of the longer-term call with the stock exactly at the striking price. Since commission costs are relatively large in spread transactions, it would be best to have the computations include commissions. Calculating a second profit potential is sometimes useful as well – *the profit if unchanged.* To determine how much profit would be made if the stock were unchanged at near-term expiration, assume that the spread is closed with the near-term call equal to its intrinsic value (zero if the stock is currently below the strike, or the difference between the stock price and the strike if the stock is initially above the strike). Then use the pricing model to estimate the value of the longer-term call, which will then have three or six months of life remaining, with the stock unchanged. The resulting differential between the near-term call's intrinsic value and the estimated value of the longer-term call is an estimate of the price at which the spread could be liquidated. The profit, of course, is that differential minus the current (initial) differential, less commissions.

In the earlier discussion of calendar spreads, it was pointed out that there is both an upside break-even point and a downside break-even point at near-term expiration. These break-even points can be estimated with the use of the pricing model.

One method of determination involves estimating the liquidating value of the spread at successive stock prices. When the liquidating value is found to be equal to the initial value, plus commissions, a break-even point has been located.

Example: If the spread in question is using options with a striking price of 30, one would begin his break-even point calculations at a price of 30. Estimate the liquidating value of the spread at 30, 29⅞, 29¾, 29⅝, and so forth until the break-even point is found. Once the downside break-even point has been determined in this manner, the iterations to locate the upside break-even point should begin again at the striking price. Thus, one would evaluate the liquidating value at 30, 30⅛, 30¼, and so on. This is somewhat of a brute-force method, but with a computer it is fairly fast. The number of calculations can be reduced by adopting a more complicated iteration process.

A final useful piece of information can be obtained with the aid of the pricing model – *the theoretical value of the spread.* Recompute the estimated value of both the near-term and longer-term calls at the current time and stock price, using the implied volatility for the underlying stock. The resultant differential between the two estimated call prices may differ substantially from the actual differential, perhaps highlighting an attractive calendar spread situation. One would want to establish spreads in which the theoretical differential is *greater than* the actual differential (that is, he would want to buy a "cheap" calendar spread).

Once these pieces of information have been computed, the strategist can rank the spread possibilities by whatever criterion he finds most workable. *The logical method of ranking the spreads is by their return if unchanged.* The spreads with the highest return if unchanged at near-term expiration are those in which the stock price and striking price were close together initially, a basic requirement of the neutral calendar spread. More complicated ranking systems should try to include the theoretical value of the spread and possibly even the maximum potential of the spread. *A similar analysis can, of course, be worked out for put calendar spreads,* using the arbitrage pricing model for puts.

RATIO STRATEGIES

Ratio strategies involve selling naked options. Therefore, the strategist has potentially large risk, either to the upside or to the downside or both. He should attempt to get a feeling for how probable this risk is. The formulae for determining the probability of a stock being above or below a certain price at some time in the future can give him these probabilities. For example, in a straddle writing situation, the strategist would want to compute such arithmetic quantities as maximum profit potential, return if unchanged, collateral required at upside break-even point or at upside

action point (recall that the collateral requirement increases for naked options on an adverse stock movement), and the break-even points themselves. The probabilities of being above the upper break-even point at expiration or below the lower break-even point should be computed as well. Moreover, an expected return analysis could be performed on the position to determine the general level of profitability of the position with respect to all other positions of the same type on other stocks. Such an expected return analysis need not assume that the position is held to expiration. Firm traders, paying little or no commissions, might be interested in seeing the expected results for a holding period as short as 30 days or less. Public customers might use a longer holding period, on the assumption that they would not trade the position as readily because of commission costs. Ratio positions should be ranked either by return if unchanged or by expected return.

The analyses described for calendar spreads and ratio positions should not be relied upon as gospel. In the proposed forms of analysis, one is projecting future option prices and stock prices under the assumption that the volatility of the underlying stock will remain the same. Although this may be true in some cases, there will also be many times when the volatility of the underlying stock will change during the life of the position. If the volatility decreases, the projected break-even points for a calendar spread will be too far away from the striking price. Thus, a loss would result at some prices where the spreader expected to make money. If the volatility increases, the expected return of a ratio position will drop, because the probabilities of the stock moving outside the profit range will increase, thereby increasing the probability of loss.

The effect of a changing volatility can be counteracted, in theory, by continuing to monitor the position daily after it has been established. In a straddle write, for example, if the stock begins to move dramatically, the expected return may become very low. If this happens, adjustments could be made to the position to improve it. Such monitoring is difficult to apply in practice for the public customer, because the commission costs involved in constant position adjustments would mount rapidly. There is no exact method that would allow for infrequent, periodic adjustments, but *by using a follow-up analysis the public customer may be able to get a better feeling for the timing of adjusting a position.* For example, suppose that one initially wrote a 5-point straddle when the stock was at 30. Sometime later, the stock is at 34. The expected return of writing a 5-point straddle with a strike of 30 when the stock is at 34 could be computed for the shorter time period remaining until expiration. If the expected return is negative, an adjustment needs to be made. Adopting this form of adjusting would keep the number of trades to a minimum, but would still allow the strategist to determine when his position has become improperly balanced. Of course, the current volatility would be used in making these determinations. Another

follow-up monitoring technique, using the deltas of the options involved, is presented later in this chapter, and has been described several times previously.

FACILITATION OR INSTITUTIONAL BLOCK POSITIONING

In this and the following section, *the advantages of using the hedge ratio are outlined.* These strategies are primarily member firm, not public customer, strategies, since they are best applied in the absence of commission costs. An institutional block trader may be able to use options to help him in his positioning, particularly when he is trying to help a client in a stock transaction.

Suppose that a block trader wants to make a bid for stock to facilitate a customer's sell order. If he wants some sort of a hedge until he can sell the stock that he buys, and the stock has listed options, he can sell some options to hedge his stock position. To determine the quantity of options to sell, he can use the hedge ratio. The exact formula for the hedge ratio was given earlier in this chapter, in the section on the Black–Scholes pricing model. It is one of the components of the formula. Simply stated, the hedge ratio is merely the delta of the option – that is, the amount by which the option will change in price for small changes in the stock price. By selling the correct number of calls against his stock purchase, the block trader will have a neutral position. This position would, in theory, neither gain nor lose for small changes in the stock price. He is therefore buying himself time until he can unwind the position in the open market.

Example: A trader buys 10,000 shares of XYZ, and a January 30 call is trading with a hedge ratio of .50. To have a neutral position, the trader should sell options against 20,000 shares of stock (10,000 divided by .50 equals 20,000). Thus, he should sell 200 of the January 30's. If the hedge ratio is correct – largely a function of the volatility estimate of the underlying stock – the trader will have greatly eliminated risk or reward on the position for small stock movements. Of course, if the block trader wants to assume some risk, that is a different matter. However, for the purposes of this discussion, the assumption is made that the block trader merely wants to facilitate the trade in the most risk-free manner possible. In this sample position, if the stock moves up by 1 point, the option should move up by ½ point. The trader would make $10,000 on his stock position and would lose $10,000 on his 200 short options – he has no gain or loss. Once the trader has the neutral position established, he can then begin to concentrate on unwinding the position.

In actual practice, this hedge ratio may not work exactly, because it tends to change constantly as the stock price changes. If the trader finds the stock moving

more than fractionally, he may have to add more calls or buy some in, to maintain a neutral hedge ratio. This would expose him to some risk, but the risk is substantially smaller than if he had not hedged at all. Of course, there would also be certain cases in which he would profit by the stock price change. For example, implied volatility could decrease, making the calls cheaper.

A similar hedge can be established by the block trader who sells stock to accommodate a customer buy order. He could buy calls in accordance with the hedge ratio, to set up a neutral position.

This process of facilitation is quite widely practiced, especially by brokerage houses that are trying to attract the business of the large institutional customer. Since the introduction of listed call options and their applications for facilitating orders, many quotes for large blocks of stock have improved considerably. The block trader (who works for the brokerage house) is willing to make a higher bid or a lower offer if he can use options to hedge his position. This facilitation with options results in a better market (higher bid or lower offer) from the point of view of the institutional customer. Without the availability of such listed options, the block trader would probably make a bid or an offer that was substantially away from the prevailing market price in order to work out of his stock-only position with a lessened degree of risk. This would obviously present a poorer market for the institutional customer.

THE NEUTRAL SPREAD

The hedge ratios of two or more options may be used to determine a neutral spread. This strategy is especially useful to market-makers on the options exchanges who may want to reduce the risk of options bought or sold in the process of providing a public market. If the hedge ratios of two options are known, *the neutral ratio is determined by dividing the two hedge ratios.*

Example: An XYZ January 35 has a hedge ratio of .25, and an XYZ January 30 has a hedge ratio of .50, so a neutral ratio would be 2:1 (.50 divided by .25). That is, one would sell 2 January 35's against one long January 30, or, conversely, would buy 2 January 35's against one short January 30. Thus, a market-maker who has just bought 50 January 30's in an effort to provide a market for a public seller of that call could hedge his position by selling 100 January 35's. This should keep his risk small, for small stock price changes, until he can unwind the position. The ratio for the neutral spread is not as sensitive to the volatility estimate of the underlying stock as is the ratio concerning stock and options. This is because the same volatility estimate is applied to both options, and the resultant ratio for the spread would not tend to change greatly.

The risk trader can also use the neutral spread ratio to his advantage. This concept was illustrated several times in previous chapters describing ratio writing, ratio spreads, and straddle writes. Ratio spreads are quite popular with member firm traders and floor traders. Recall that a ratio spread consists of buying options at a certain strike, and selling more options further out-of-the-money. The hedge ratios can, of course, be used by the trader, or by a public customer, to initially establish a neutral position. Perhaps more important, the hedge ratio can also be used as a follow-up action to keep the position neutral after the stock changes in price. This strategy is the "delta spread" described in Chapter 11.

The risk trader is not attempting to establish the spread with the idea of minimizing risk for small stock movements. Rather, he is looking to make a profit, but would prefer to remain as neutral as possible on the underlying stock. He is implementing a risk strategy that has a neutral outlook on the underlying stock. He is selling much more time value premium than he is buying.

Example: The purchase of 15 January 30 calls and the sale of 30 January 35 calls – a ratio call spread – may be a position taken for profit potential. It would be a neutral position if the deltas were .60 and .30, for example. This spread would do best if the stock were at exactly 35 at expiration. However, if the stock rose quickly before expiration, the spread ratio would decrease from 2:1 to perhaps 3:2. That is, the neutral ratio between the January 30 call and the January 35 call should be 3 short January 35's to 2 long January 30's. If the trader wants to balance his position, he could buy 5 more January 30's, giving him a total of 20 long versus the 30 short January 35's that he originally sold. Conversely, if the stock dropped in price, the neutral spread ratio might increase, indicating that more calls should be sold. For example, if this stock declines, the neutral ratio might be 3:1. In that case, 15 more January 35's could be sold, making the position short 45 calls versus 15 long calls, which would produce the neutral 3:1 ratio.

It would not be proper to adjust the ratio constantly, because the frequent whipsaw losses on trading movements would wipe out the profit potential of the position. However, the trader may want to pick out points, in advance, at which he wants to reevaluate his position before something drastic goes wrong. For example, if the foregoing spread were established with the stock at a price of 30, the spreader might want to readjust at 33 or 27, whichever comes first.

By monitoring the spread using the hedge ratio, the trader may also be able to discern whether he has established too bullish or too bearish a position.

Example: The trader starts with the example described above – long 15 January 30 calls and short 30 January 35 calls – when the hedge ratios were .60 and .30, respec-

tively. Some later time, the stock falls to 27 and the trader needs to reevaluate his position. The hedge ratios may have become .42 for the January 30 and .14 for the January 35, indicating that a 3:1 ratio would be neutral (.42/.14 = 3). He now has a bullish position, because his 2:1 ratio is *less than* the neutral 3:1 ratio. It is not mandatory that the trader act on this information. He may actually be bullish on the stock at this point and decide to remain with his position. The usefulness of the hedge ratio is that it allows him to see that his position is bullish, so he can make a correct judgment. Without this knowledge, he might still think his position to be neutral, a critical mistake if he indeed wants to be neutral. If the trader's ratio is *greater than* the neutral ratio (2:1 vs. 3:2, for example), he is bearishly positioned.

As a final point, it should be noted that the ratio can be adjusted by buying or selling either option.

Example: If the stock falls and it is desired that the ratio be increased to 3:1, one might sell more January 35's or might decide to sell out some of his January 30's. A bullish adjustment could be made by buying on either side of the spread in a similar manner. In general, one should adjust by selling time premium or buying intrinsic value. That is, out-of-the-moneys are usually sold and in-the-moneys are usually bought, when adjusting.

AIDING IN FOLLOW-UP ACTION

The computer can also be an invaluable aid to the strategist in that it can help him monitor his positions. It is generally necessary for the strategist to have some way of inputting his positions into an inventory database and also to have some way of identifying different securities that are grouped within the same trading position. Once this has been done, *the computer can simultaneously read pricing data (either real-time or closing prices) and the inventory database to generate information concerning the current status of any position.*

A current mark to market (profit and loss) statement is of obvious use in that the trader can see how he is doing each day. The computer can also easily generate a set of warning flags that may be of interest to the trader, and could produce a list summarizing possible positions that need action. In most of the strategies that were described, it was shown that the strategist should avoid early assignment if at all possible. It is a simple matter for the computer to calculate the remaining time value premium of any short options, and to warn the trader if there is only a small amount of time value premium remaining, perhaps ½ point or less. For similar reasons, the trader may want to have a daily list of positions that are nearing maturity, perhaps

with less than 1 month of life remaining in the options. A flag indicating an approaching ex-dividend date might also be useful for this purpose.

If the trader inputs another piece of information into the database, the computer can help him in another follow-up action. In most strategies that were described, especially those involving uncovered options, the trader wants to take some sort of follow-up action based on the price movement of the underlying stock. If the stock rallies too far, he may want to cover short calls or buy other calls as protection. If the stock declines too far, similar maneuvers would apply to put options or to rolling down short calls. If the trader inputs the stock prices at which he would like to take action, the computer can monitor each day's closing price of the stock and generate a list of positions that have exceeded their upside or downside action points.

The computer can also do more sophisticated types of position monitoring. Recall that it was pointed out that the deltas of the options involved in a position can be compared to each other to tell whether the position is bullish or bearish. The Black–Scholes model can be used to calculate the deltas of the options in one's positions. Then the net position can be determined by the computer, thereby telling the trader whether his position has become "delta long" (bullish), "delta short" (bearish), or neutral. If he sees that a position is bearish and he does not want to be structured in that way, he can make bullish adjustments. The delta spread and neutral spread strategies very conveniently lend themselves to such types of follow-up action, although any of the more complicated straddle writing and protected straddle writing positions can be monitored usefully in this way as well.

The computation for determining whether a position is net short or net long generally involves calculating the "equivalent stock position" (ESP). If one owns 10 calls that have a delta of .45, his equivalent stock position from those calls is 10×100 shares per call $\times .45 = 450$. That is, owning those 10 calls is equivalent to owning 450 shares of the underlying stock, according to the delta. All puts and calls can be reduced to an ESP and can then, of course, be combined with any actual long or short stock in the position to produce an ESP for the entire strategy. The resultant ESP for each of the trader's positions can be printed from the computer along with the items described above.

Further sophisticated measures can be taken. The computer can generate a table of results at expiration. If so desired, this could be presented as a graph, but that is not really necessary. A table suffices quite well, as shown by most of the examples in this book. Such a picture has meaning only if all options in the position expire at the same time. If they don't, one may instead want the computer to compose a table of results or a graph at *near-term expiration.* Thus, in a calendar spread, for example, one could see what sorts of profitability he would be looking at when it was time to remove the spread.

Finally, the computer can compute the expected return of a position already in place. This would give a more dynamic picture of the position, and this expected return is usually for a relatively short time period. That time period might be 30 days, or the time remaining until expiration, whichever is less. The expected return is calculated in much the same manner as the expected return computation described earlier in this chapter. First, one uses the stock's volatility to construct a range of prices over which to examine the position. Second, one uses the Black–Scholes model to calculate the values of the various options in the position at that future time and at the various stock prices. Some of the results should be displayed in table form by the computer program. The expected profit is computed, as described earlier, by summing the multiples of the probabilities of the stock being at each price by the result of the position at that price. The expected return is then computed by dividing the expected profit by the expected investment. Since margin computations can require involved computer programs, it is sufficient to omit this last step and merely observe the expected profit. The following example shows how a sample position might look as the computer displays the position itself, the ESP, the profit at expiration, and the expected profit in 30 days. A complex position is assumed, in order that the value of these analyses can be demonstrated.

Example: The following position exists when XYZ is at 31¾. It is essentially a backspread combined with a reverse ratio write. It resembles a long straddle in that there is increased profit potential in either direction if the stock moves far enough by expiration. Initially, the computer should display the position and the ESP.

Position		Delta	ESP	
Short	4,500 XYZ	1.00	Short	4,500 shares
Short	100 XYZ April 25 calls	0.89	Short	8,900 shares
Long	50 XYZ April 30 calls	0.76	Long	3,800 shares
Long	139 XYZ July 30 calls	0.74	Long	10,286 shares
Total ESP			Long	686 shares
Total money in position: $163,500 credit				

The advantage of using the ESP is that this fairly complex position is reduced to a single number. The entire position is equivalent to being long 686 shares of the common stock. Essentially, this is close to delta-neutral for such a large position. The next item that the computer should display is the total credit or debit in the position to date. With this information, an expiration picture can be drawn if it is applicable. In this position, since there is a mixture of April and July options, a strict expiration pic-

ture does not apply. Rather, the computer should draw a picture based on the position at April expiration or on a shorter time horizon.

Assume that April expiration is still some time away, so that the computer will instead draw the picture 30 days hence. In order to do so, the computer uses the stock's volatility to project stock prices 30 days in the future. Seven stock prices are shown in the next table; they represent points along the distribution curve of the stock, ranging from minus one and one-half standard deviations to plus one and one-half standard deviations of movement from the current stock price. While these seven points certainly do not comprise the entire spectrum of possible stock moves, they are a representative sample.

Stock Price in 30 Days	Standard Deviations	Expected Results
$35\frac{3}{8}$	+1.5	+\$15,847
$34\frac{1}{8}$	+1.0	+ 12,355
$32\frac{7}{8}$	+0.5	+ 10,097
$31\frac{3}{4}$	0.0	+ 9,443
$30\frac{5}{8}$	−0.5	+ 10,743
$29\frac{1}{2}$	−1.0	+ 14,172
$28\frac{1}{2}$	−1.5	+ 19,605
Expected profit		+\$11,426

Obviously, this position has had some profitable adjustments made to it in the past. That is not important at this point, because the trader is interested only in the future. If the current mark to market of this position were in excess of $11,426, then he should consider removing the position, since it would be more profitable than the expected profit.

IMPLEMENTATION

Many of the analyses described in this chapter can be obtained from a reliable data service or brokerage firm. The strategist who plans to prepare his own analysis, either by himself or by contracting the programming work out, should be aware that computer programs cannot be written in the COBOL language, because the mathematics are far too complicated for a business language. Languages such as Pascal, C, C++, Visual Basic, or any high-level structured programming language would suffice, although Java could be considered as well, keeping in mind that Java's main usage is not for computational purposes. Reliable option pricing data that include dividend

information on the underlying stock are also necessary. The larger programmable calculators can handle calculations such as the Black–Scholes model, computing the hedge ratio, and determining the probability of a stock being above or below a certain price at some future time. However, more involved calculations, such as computing the implied volatility or determining the expected return of a position, require the use of a computer.

SUMMARY

Two basic mathematical aids have been presented: the pricing model and the ability to predict the probability of a stock's movement. The hedge ratio and the expected return analysis are extensions of the basic aids. Any strategy can be evaluated with these tools. Such an analysis should be able to give the trader or strategist some idea of the relative attractiveness of establishing the position, and may also aid in making follow-up adjustments to the position. All the analyses rely heavily on one's estimate of the volatility of the underlying stock. Using the implied volatility seems to be one of the best ways to obtain an accurate, current volatility estimate, since it is derived from the prices in the market itself. The applications presented here are not all-inclusive. The strategist who is, or becomes, familiar with the advantages of rigorous mathematical analysis will be able to construct many other aids for his trading that utilize the basic mathematics described in this chapter.

PART V

Index Options and Futures

CHAPTER 29

Introduction to Index Option Products and Futures

Since their introduction in 1981, listed index options have proved to be very popular. Index options are options whose underlying security is not a single stock but rather an index composed of many stocks. These include options on index futures contracts. Most popular types of cash settlement options are options on indices or subindices. The strategies employed in trading these options are not substantially different from those used in trading stock options, with a few notable exceptions. However, the options themselves tend to be priced differently and to trade differently. It is these differences between stock options and index options on which we will predominantly concentrate.

Index products – cash-based options, futures-based options, and index futures – will be the main topic of discussion in this section of the book. We will look at how indices are constructed, how to use these products to speculate, how to hedge, and how to spread one index against another. Both futures and options will be used in these strategies. The discussion of other futures options – currencies, grains, bonds, etc – will be deferred to a later chapter.

In this chapter, we will be looking at introductory facts about index options and futures which differentiate them from the equity options that have encompassed the entire previous part of this book. First, however, we will take an in-depth look at stock indices and the methods of calculating them. Also in this chapter there will be a discussion of futures contracts and how trading them differs from trading stocks and stock options.

INDICES

Since many cash-based or futures options have an index of stocks underlying the option, it is useful to understand how indices are calculated, in order that one may be able to understand how an individual stock's movement within the index affects

the overall value of the index. The indices on which options are traded are generally stock indices – that is, the items making up the index are stocks. There are two main ways of calculating a stock index: weighted by price or weighted by capital.

CAPITALIZATION-WEIGHTED INDICES

The capitalization of a stock is the total dollar value of its securities to current market prices: It is the multiple of the number of shares outstanding (the float) and the current stock price. In a capitalization-weighted index, the capitalizations of all stocks in the index are computed and added together to produce the total market value of the index. The price of each stock in the index is multiplied by the total number of shares of that stock that are outstanding (the "float"), and their sum is calculated. Finally, this total sum is divided by another number, termed the "divisor," to produce the final index value. An example will help to illustrate the concept of calculating the value of a capitalization-weighted index.

Example: Suppose that an index is composed of three stocks whose prices and floats are given in the following table. The multiple of price times float (capitalization) is also included in the table.

Stock	Price	Float	Capitalization
A	30	175,000,000	5,250,000000
B	90	50,000,000	4,500,000,000
C	50	100,000,000	5,000,000,000
		Total capitalization:	14,750,000,000

Most indices use a divisor since it would be unwieldy to say that the index closed at 14,750,000,000 (for example, think of trying to quote the Dow-Jones Industrial Average as such a large figure). The divisor is generally an arbitrary number that is initially used to reduce the index value to a workable number. When an index is initiated, the divisor might be set so that the index starts out at an even number. Suppose that in the sample index above, we wanted the initial value – as represented by the given prices and floats – to be 100.00. Then we would set the initial divisor to 147,500,000. Thus the total capitalization of the index divided by the divisor would give a value of 100.00.

The divisor of an index can be changed to provide continuity for the index's value when changes occur in the individual components. Note that the divisor does not have to be changed when a stock splits, because the price is adjusted downward automatically by an amount equal to the increase in the float of the stock that is splitting. Notice that in the above example, if stock B should split 2-for-1 then its price

would be 45 (90 ÷ 2) and its float would double to 100 million shares from 50 million. Thus, the capitalization of stock B remains the same: $4,500,000,000.

However, if a stock should alter its capitalization in a manner that is not reflected by an automatic adjustment in its price, then the divisor must be changed. For example, a company might issue more stock in a secondary offering – something that would not cause the exchange where the stock is listed to automatically reduce the price of the stock. To produce continuity in the value of the index between the day the secondary is issued and the day after it is issued, the divisor is changed to keep the index value the same. Consider the following example.

Example: Using the same sample index as before, suppose that the following prices exist at the closing one day:

Stock	Price	Float	Capitalization
A	40	175,000,000	7,000000000
B	80	50,000,000	4,000,000,000
C	60	100,000,000	6,000,000,000
	Total capitalization:		17,000,000,000
	Divisor: 147,500,000		
	Index value: 115.25		

Now suppose that stock A issues a 2-million-share secondary that evening, giving that stock a total float of 177 million shares. Such an action would change the value of the index as follows:

Stock	Price	Float	Capitalization
A	40	177,000,000	7,080,000,000
B	80	50,000,000	4,000,000,000
C	60	100,000,000	6,000,000,000
	Total capitalization:		17,080,000,000
	Divisor: 147,500,000		
	Index value: 115.80		

However, it makes no sense to change the value of the index from 115.25 to 115.80 when nothing actually changed in the marketplace. If investors deem it necessary to lower the price of stock A in the marketplace because of the secondary issue, so be it. But such a change in investor philosophy would be reflected in the price of the index as the stock drops. So, in order to keep the value of the index the same on the morning after the secondary is issued, the divisor must be changed to reflect the extra 2 million shares of stock A. The new divisor would be equal to the new total capital-

ization (17,080,000,000) divided by the old index value (115.2542373). This would give the new divisor:

New divisor: 148,194,117.6

As this example demonstrates, the divisor of a capitalization-weighted index can change quite often. Fortunately, there are organizations that are responsible for keeping the index current and for calculating the divisor every time it needs changing. Thus, an investor who needs to know the latest divisor can generally find it out by making a phone call or visiting a Web site. This is far easier than keeping track of everything by oneself.

In a capitalization-weighted index, the stocks with the largest market value have the most weight within the index. This means that indices that contain such largely capitalized stocks as IBM, AT&T, General Electric, Exxon, and General Motors will be dominated by those stocks. For example, the S&P 500 is one of the largest capitalization-weighted indices in terms of the number of stocks (500). However, IBM has such a large capitalization that it accounts for over 5% of the index. Obviously, there are many stocks in the S&P 500 that do not really have much weight at all. *In order to compute the percentage that a stock comprises of the index, it is merely necessary to divide that stock's capitalization by the total capitalization of the index.* Using the previous example, one can see how the percentage is computed.

Stock	Price	Float	Capitalization	Pct
A	40	177,000,000	7,080,000,000	41.5%
B	80	50,000,000	4,000,000,000	23.4%
C	60	100,000,000	6,000,000,000	35.1%
	Total capitalization:		17,080,000,000	100.0%

Another interesting statistic to know regarding any index is how many shares of each stock are in the index. In a capitalization-weighted index, *the number of shares of each stock is determined by dividing the stock's float by the divisor of the index.* In the same sample index, the following table shows how many shares of each stock are in the index.

Stock	Price	Float	Capitalization	Shares
A	40	177,000,000	7,080,000,000	1.20
B	80	50,000,000	4,000,000,000	0.34
C	60	100,000,000	6,000,000,000	0.68
		Total capitalization:	17,080,000,000	
		Divisor: 147,500,000		
		Index value: 115.80		

Thus, if stock A goes up by one point, then the value of the index would increase by 1.20 points since there are 1.2 shares of stock A in the index. One can see the value of computing such a statistic – it readily allows him to see how any individual stock's movement will affect the index movement during a trading day. This is especially useful when a stock is halted, but the index itself keeps trading.

Example: Suppose that, in the above index, stock C has halted trading. There are 0.68 shares of stock C in the index. Suppose that stock C is indicated 3 points lower, but that the index is currently trading unchanged from the previous night's close due to the fact that both stocks A and B are unchanged on the day. If one were to try to price the options on the index, he would be wrong to use the current price of the index since that will soon change when stock C opens. However, there is not really a problem since one can readily see that if stock C opens 3 points lower, then the index will drop by 2.04 points (3×0.68). Thus one should price the options as if the index were already trading about 2 points lower. This kind of anticipation depends, of course, on knowing the number of shares of stock C in the index.

A similar type of analysis is useful when trying to predict longer-term effects of a stock on an index. If you thought stock C had a chance of rallying 30 points, then one can see that this would cause the index to rise over 20 points. Given this type of relationship, there are sometimes option spreads between the stock's options and the index's options that will be profitable based on such an assumption.

It should also be noted that the number of shares of stock in a capitalization-weighted index does not change on a daily basis since it does not depend on the price of the stocks in the index. However, *the percent that each stock comprises of the index does change each day as prices change.* Thus, the number of shares is a more stable statistic to keep track of, and is also more directly usable to anticipate index value changes as stock prices change.

Capitalization-weighted indices are the most prevalent type, and most investors are familiar with several of them: the Standard and Poor's 500, the Standard and Poor's 400, the Standard and Poor's 100 (also called by its quote symbol, OEX), the New York Stock Exchange Index, and the American Stock Exchange Index.

PRICE-WEIGHTED INDICES

A price-weighted index contains an equal number of shares of each stock in the index. A price-weighted index is computed by adding together the prices of the various stocks in the index and then dividing that sum by the divisor to produce the index value. Again, the divisor is initially an arbitrary number that is used to produce a desired original index value-something like 100.00, for example. Let us use the same

three stocks we were using above to construct an example of a price-weighted index. Assume the divisor at the time of this example is 1.65843.

Stock	Price
A	30
B	90
C	50
Price total:	170
Divisor: 1.65843	
Index value: 102.51	

Unlike the capitalization-weighted index, the divisor needs to be changed when a stock's price is adjusted by the exchange where it is listed (as in a stock split or stock dividend) but does not have to be adjusted when the company issues more stock. That is, the divisor in a price-weighted index is changed when the price of the stock is adjusted, but not when the stock's capitalization is changed.

If a certain stock issues new stock in a secondary offering, the exchange where its stock is listed will not automatically adjust the price of the stock downward. Hence, there is no change to the divisor of any price-weighted index containing that stock because the closing price of the stock was not adjusted by the exchange.

However, in the above example, if stock B should split 2-for-1, the exchange would change its closing from 90 to 45. Thus, the sum of the stocks in the price-weighted index would change without the market even being open. Consequently, the divisor would need to be changed to reflect the split. The following example sums up the situation after stock B splits 2-for-1.

Stock	Price
A	30
B	45
C	50
Price total:	125
Old divisor: 1.65843	
Previous closing index value: 102.51	
New divisor (i.e., the divisor necessary to keep the index value unchanged): 1.21943	

The new divisor is calculated by dividing the new sum of the prices, 125, by the old closing price, 102.51. Thus the divisor is reduced in order to produce the same index value – 102.51 – even though the sum of the prices of the stocks in the index is now 125 instead of the previous 170. Note that the new divisor is not dependent on the old divisor.

Another statistic that we looked at with capitalization-weighted indices was the number of shares of each stock in the index. In a price-weighted index each stock in the index has the same number of shares and that number is equal to 1 divided by the divisor of the index. In the last example above, with the divisor equal to 1.21943, there would be 1/1.21943 or 0.82 shares of each stock in the index. Thus any stock that was up by 1 point during a given day would be contributing an upward movement of 0.82 points in the index. Before the split there were 0.60 (1/1.65843) shares of each stock.

Another way to look at the revision of a price-weighted index following a split by one of its stocks is the following: If one stock splits, then to reestablish the fact that there are an equal number of shares of each stock in the index, part of the extra (split) shares should be sold off and used to buy an equal number of shares of each of the remaining stocks. Note that before the split there were 0.60 shares of each stock, and 0.82 shares after. When stock B split 2-for-I, it increased its shares from 0.60 to 1.20, so to rebalance the index it was necessary to sell 0.38 shares of stock B and use the proceeds to buy 0.22 shares of each of stocks A and C.

A price-weighted index's divisor can be subject to fairly frequent revision, just as was the case with the capitalization-weighted index. These divisors are maintained by the organizations responsible for originating them, and they can be easily obtained just by calling the proper organization. The most popular price-weighted indices are the various DowJones indices and the Major Market Index (XMI).

The stock with the most weight in a price-weighted index is the one with the highest price, which is substantially different from the capitalization-weighted index where the stock with the most weight is the one with the most market value. Thus, in the above examples, the stock with the greatest weight in the index would be stock B before the split and C after the split. Of course, the matter of a stock's volatility has something to do with which stock has the most weight in the change of the value of the index. Thus, if stock B was the highest-priced stock at $90 per share, but had a very low volatility, then its price changes would be small and it might consequently not have as great an influence on the changes in the price of the index as some lower-priced stock would.

In general, one is far less concerned with a stock's weight in a price-weighted index than he is in a capitalization-weighted index. That is, one might notice that four or five large stocks – IBM, AT&T, Exxon, General Motors, and General Electric, for example – might make up over 30% of the S&P 100 even though they represent only 5% of the stocks in the index. However, the same five stocks in a price-weighted index of 100 stocks would probably account for very nearly 5% of the index because their prices are not substantially different from those of the other 95 stocks (even though their capitalizations are). So if one were to notice a large change in the price

of IBM, one might figure that capitalization-weighted indices that contained that stock would also be showing somewhat unusual price changes in the same direction that IBM is moving. A price-weighted index that contained IBM would, of course, also be affected by IBM's price change, but not extraordinarily so since IBM would have far less weight in the price-weighted index.

SECTORS

Sector is a term used to refer to an index of stocks in which all the stocks are members of the same industry group. Examples of groups on which sectors have been created – and on which options have traded – are computers and technology, international oils, domestic oils, gold, transportation, airlines, and gaming and hotels. These indices are computed in the same ways as described above – either price-weighted or capitalization-weighted. They generally consist of fewer stocks than their major counterparts, however. Most sectors are comprised of between 20 and 30 stocks, since that is about all of the stocks in any one specific industry group. The large indices are usually referred to as "broad-based" indices, as opposed to the smaller sectors which are often referred to as "narrow-based" indices.

Options trade on these sectors. The intent of these options is to allow portfolio managers – who often are group-oriented – to be able to hedge off parts of their portfolio by industry group. The options on these sectors are usually cash-based options. Strategies will be discussed later, but there is not much difference in strategy between broad-based or narrow-based index options. One difference is that broad-based option writers receive more favorable margin treatment (that is, they are required to put up less collateral) than narrow-based option writers.

CASH-BASED OPTIONS

Now that the reader is familiar with indices, let us look at the most popular type of listed index option, the cash-based option.

Cash-based options do not have any physical entity underlying the option contract. Rather, if the option is exercised or assigned, the settlement is done with cash only – there is no equity involved. This type of option is generally issued on an index, such as the S&P 500, for which it would be virtually impossible to actually deliver the underlying securities in case of assignment or exercise.

Since many investors feel that it is easier to predict the market's movement rather than that of an individual stock, the cash-based index option has become very popular. Other indices that underlie cash-based option contracts are the New York Stock Exchange Index, the S&P 500 Index, the S&P 100 Index (OEX – an index

introduced by the CBOE), the NASDAQ Index ($NDX), the Dow-Jones 30 Industrials ($DIX), and several other indices. In each of these cases there are too many stocks in the index, and too many varying quantities of each of the stocks, to be able to handle the physical delivery of each of the stocks in the case of exercise or assignment. Some cash-based options are based on subindices (that is, subgroups of the larger indices such as the transportation group).

EXERCISE AND ASSIGNMENT

It is important to understand the ramifications of exercise and assignment when dealing with this type of option. *When a cash-based option is exercised, the owner receives cash equal to the difference between the index's closing price and the strike price of the option.* The option writer who is assigned must pay out an equal amount. The following example shows how a call exercise might work. In this and the following examples we will use a fictional index ZYX (index symbols often end in X).

Example: Suppose an investor buys a ZYX September 160 call option. At a later date, the index has risen substantially in price and closes at 175.24 on a particular day. The investor decides it is time to take his profit by exercising his call option. Assuming the ZYX contract is worth $100 per point, just as stock options are, he receives cash in the amount of $100 times the difference between the index closing price and the strike price: $100 × (175.24 – 160.00) = $1,524. He has no further position or rights – the option position disappears from his account by virtue of the exercise and he does not acquire any security by the exercise; he gets only cash.

An assignment would work in a similar manner, with the seller of an option having to pay out of his account cash equal to the difference between the index closing price and the option's striking price. As an example, suppose that a trader sells a put option on the ZYX Index – the October 165 put. Subsequently, the index drops in price, and one morning the writer of this put option finds that he has been assigned (as of the previous day, as is the case with stock options). If the index closed at 157.58 on the previous day, then the option writer's account will be debited an amount equal to $100 × (165.00 – 157.58) = $742.

EUROPEAN VERSUS AMERICAN EXERCISE

Before proceeding with more examples of index option exercise and the accompanying strategies, it is necessary to introduce two new definitions. *American exercise* means that an option may he exercised at any time; *European exercise* means that an option may only be exercised on its expiration day. Many of the cash-based index

options have the European exercise feature. All stock options and some index options have the American exercise feature.

The European exercise feature was introduced because institutional investors who might tend to write calls against their portfolio of stocks wanted some assurance that their protection wouldn't be unexpectedly taken away from them. Thus several index option series became European exercise. Two major ones are the cash-based index options on the S&P 500 Index (SPX) and the cash-based options on the Dow-Jones 30 Industrials. OEX remains an American exercise.

In-the-money European put options will be cheaper than their American counterparts. This is because an arbitrageur would have to carry the position all the way to expiration; he could not exercise his puts and liquidate the position immediately. In fact, deeply in-the-money European puts will trade at a discount; the higher short-term interest rates are, the deeper the discount will be.

This can affect the full protective capability of long-term European puts. If a portfolio manager buys puts to protect his portfolio and the market crashes, the puts might be deeply in the money. If these puts have a European exercise feature, they would be selling at a deep discount and therefore would not have afforded all the price protection that the portfolio manager had been looking for.

American Exercise Consideration. The primary reason for the holder of an index option to exercise the option is to take his profit. One might think that, if the holder wanted to take a profit, he would merely sell his option in the open market. Of course, if he could, he would. However, many times the deeply in-the-money options sell at a substantial discount during the trading day. A deep discount is considered to be 1/2 to 3/4 of a point, or more. Near the end of the day, these options tend to trade at only slight discounts. In either case, the holder of the option may decide to exercise rather than to sell at any discount. Of course, if one is the holder of a call option that is trading at a substantial discount in the morning of a particular day, and he decides to exercise, he may lose more by the end of the day (if the market trades down) than he would have if he had merely sold at the deep discount in the first place. In fact, some theoreticians feel that the "job" of a deeply in-the-money cash-based option during the trading day is to try to predict the market's close. This, of course, is not a "job" that can be consistently done with accuracy (if it could, the traders doing the predicting would be rich beyond their wildest dreams).

If the holder of a cash-based call option turned bearish, that would be another reason to exercise. That's right – if the holder of a cash-based call option is bearish, he should exercise because, by so doing, he liquidates his bullish position and takes his profit. This is somewhat opposite from an option that has a physical underlying security, such as a stock option. This presents an interesting scenario: If one turns

bearish late in the day, even after the close, he might conceivably try to exercise his calls to liquidate his position. The exchanges recognize that such tactics might not be in everyone's best interest – for example, if one waited to see how the money supply numbers looked on a particular evening before exercising, he would definitely have an advantage over the writers of those same options. The writers could no longer viably hedge their positions after the market had closed. In order to prevent this, cash-based option exercise notices are only acceptable until 5 minutes after the options close trading on that exchange on any given trading day (except expiration, of course), in order to allow both holders and writers to be on somewhat equal footing.

There is one more fact regarding exercise of cash-based options that will interest brokerage customers, retail or institutional. Most brokerage firms will charge a commission for the cash-based option exercise or assignment. When index options were first traded, commissions were quite high. Currently, however, one should generally be paying a commission based upon the equivalent option price.

Example: In the previous example, one exercised a ZYX Sep 160 call at expiration when the index closed at 175.24. This is a differential of 15.24. One should pay a commission as if he had sold his long calls at a price of 15.24, not on anything more.

For writers of cash-based options, things are not so different from stock options. The writer is still warned of impending assignment by the fact that the option is trading at a discount. If it is not trading at a discount, it is probably not in danger of being assigned. Also, since there is no stock involved and therefore no dividends paid, the writer of a cash-based put option need only be concerned with whether the put is trading at a discount, not with whether it is trading at a discount to underlying price less the dividend, as is the case with stock options.

Traders doing spreads in cash-based options have special worries, however. *What may seem to be a limited-risk spread may acquire more risk than one initially perceived, due to early assignment of the short options in the spread.* Consider the following example.

Example: Suppose that an investor establishes a bearish call spread in ZYX options – he buys the November 160 call at a price of 1 and simultaneously sells the November 155 call at 3. His risk on the spread is $300 plus commissions if he has to pay the maximum, limited debit of $500 to buy back the spread, or so it appears. However, suppose that the index rises substantially in price and the spreader is assigned on the short side of his spread with the index at 175.24. He thus is charged a debit of $2,024 to "cover" each short call via the assignment: $100 times the in-the-money amount, 175.24 – 155.00, or 20.24. He receives this assignment notice in the

morning before the next trading day begins. Note that he cannot merely exercise his long, since, if he did that, he would then receive the next night's closing price for his long. Under the worst scenario, suppose the market receives disappointing economic news the next day and opens sharply lower – with the index at 172. If he sells his long Nov 160 calls at parity ($1,200), he will have paid a debit of $824 – larger than his initial, theoretically "limited" maximum debit of $500. Thus he loses $624 on this spread ($824 less the initial credit of $200) – over twice the theoretically limited loss of $300.

If the market should open sharply lower and trade down, he could lose more money than he thought because his long position is now exposed – there is no longer a spread in place after the short option is assigned. Of course, this could work to his advantage if the market rallied the next day. The point is, however, that a spread in cash-based options acquires more risk than the difference in the strikes (the maximum risk in stock options) if the short option in the spread becomes a deeply in-the-money option, ripe for assignment.

NAKED MARGIN

When an index is designated as "broad-based," a lesser margin requirement applies to the writer of naked options. The SEC determines which indices are broad-based. A broad-based index receives more favorable margin treatment because the underlying index will not normally change in price as quickly as a stock or subindex. Thus, the naked writer theoretically has less of a risk with a naked broad-based index option.

The requirement for writing a broad-based index option naked is 15% of the index, plus the option premium, minus the amount, if any, that the option is out-of-the-money. There is a minimum requirement: for calls, it is 10% of the index value; for puts, it is 10% of the striking price. Both minima are in addition to the option premium.

Example: Suppose that the ZYX is at 168.00, with a Dec 170 call selling for 6 and a Dec 170 put selling for 5. The requirement for selling the call naked would be calculated as follows:

15% of index	$2,520
Plus call premium	+ 600
Less out-of-money amount	– 200
Naked call requirement	$2,920

The requirement for writing the Dec 170 put naked would be:

15% of index	$2,520
Plus put premium	+ 500
Naked put requirement	$3,020

Both of these requirements are above the minimum of 10% of the index.

Options on narrow-based indices are subject to the same naked requirements as stock options: 20% of the index plus the premium less an out-of-the-money amount, with a minimum requirement of 15% of the index.

Other margin requirements are similar to those for stock options. For example, if one wanted to write the Dec 170 straddle naked, using the same prices as in the last example, he would have a margin requirement equal to $3,020 – the larger of the put or call requirement, just as he would for stock options. Spread requirements for index options work in exactly the same manner as they do for stock options.

LEAPS INDEX OPTIONS

LEAPS (Long-term Equity AnticiPation Securities) have been introduced on indices in recent years. Readers not familiar with LEAPS should review the prior chapter on that subject. Since LEAPS have become popular for stocks, it is only logical to think that they would become popular for indices as well.

The main problem was that a LEAPS could be a 2-year option on a 350 dollar underlying index. Such an option might cost 20 points. That is too expensive to attract the public customer. Just one option would cost $2,000. Therefore, the exchanges created mini-indices out of OEX, SPX, XMI, and others. These mini-indices that were created are exactly the same as the full indices, except that they are divided by 10. This means that instead of having the 2-year put with strike of 350 cost 20 points, a 2-year put with a strike of 35 costs 2 points. This is much more affordable for the individual trader.

The following example is of OEX options and the corresponding OAX LEAPS options on the same index. NOTE: OAX is not the universal symbol for this mini-index. OEX LEAPS are American exercise, while SPX LEAPS are European. A broker should be contacted for symbols, expiration dates, and other details.

Example: The following is a sample comparison of prices for OEX and for its companion index OLX, which is OEX divided by 5. (Originally, OLX was OEX divided by 10, but when OEX split 2-for-1 in late 1997, OLX did *not* split so OLX was thereafter equal to OEX divided by 5).

OEX: 712	OLX: 142.40
	OLX 2-year LEAPS options:
	Dec 140 call: 30
	Dec 150 call: 26.5
	Dec 160 call: 20.5

Note that striking prices of 140, 150, and 160 for OLX correspond to 700, 750, and 800 for OEX itself. Also, if a 2-year OEX Dec 700 call existed, it would sell for approximately five times as much as the OLX Dec 140 call, or about 150 points (5 times 30). This is why the LEAPS options use reduced-value strikes, because very few people would have interest in trading an at-the-money option that cost 150 points ($15,000).

FUTURES

We will now take a look at how futures contracts work. This section will be concerned only with cash-based index futures; futures for physical delivery are included in a later chapter. The ordinary stock investor might think that he will be able to employ index option strategies without getting involved in futures. While it may be *possible* to avoid futures, the strategist will realize that they are a necessary part of the entire index-trading strategy. Thus, in order to be completely prepared to hedge one's positions and to operate in an optimum manner, the use of index futures or index futures options is a necessary complement to nearly all index strategies.

A commodities futures contract is a standardized contract calling for the delivery of a specified quantity of a certain commodity at some future time. The older, more conventional types of commodities contracts were futures on grains, meats, and metals. In recent years, futures have expanded extensively and have encompassed financial securities – bonds, T-bills, Eurodollar Time Deposits, etc. Most recently, futures have been issued that are cash-based; that is, no actual commodity is deliverable. Rather, the contract settles for cash. Some of these cash-based futures contracts have stock market indices as their underlying 'commodity. "It is this latter type of future that will be the subject of the examples in this section, although the basic facts regarding futures are applicable to all futures contracts, cash-based or not.

Several types of traders or investors use futures contracts. One is the speculator: He is able to generate tremendous leverage with futures and may be able to capitalize on small swings in the price of the underlying commodity. Another is the true hedger: He is a dealer in the actual underlying commodity and uses futures to hedge his price risk. This is the more economic function of futures. Examples of hedges for physical commodities as well as stocks will be presented in later chapters. However,

let us look at a simple example of how one might hedge a stock portfolio with stock index futures.

Example: Suppose that a stock mutual fund operates under the philosophy that investors cannot outperform a bullish market, so the best investment strategy when one is bullish is just to "buy the market." That is, this mutual fund actually buys all the stocks in the Standard & Poor's 500 Index and holds them.

If the manager of this fund turns bearish, he would want to sell out his positions. However, the commission costs for liquidating the entire portfolio would be large. Also, the act of selling so much stock might actually depress the market, thereby devaluing the remainder of his portfolio before he can sell it.

This manager might sell S&P 500 futures against his portfolio instead of selling his stocks. Such a futures contract would move up or down in line with the S&P 500 Index as it rises or falls. Suppose that he sold enough futures to hedge the entire dollar value of his stock portfolio. Then, even if the stock market declined, his futures contracts would decline also and would theoretically prevent him from having a loss. Of course, he couldn't make much of a gain if the market went up, since the futures would then lose money. What this money manager has accomplished is that he has effectively sold his stock portfolio without incurring stock commission costs (futures commissions are normally quite small).

If he turns bullish again at some later date, he can buy the futures back, and have his long stocks free to profit if the market rises. Again, he does not spend the stock commission nor does he have to go through the tedious process of placing 500 stock orders to "buy" the S&P 500 – he merely places one order in futures contracts.

Futures contracts often trade at premiums to the underlying commodity, due to the fact that the investor who buys the future does not have to spend the money that one who buys all the stocks would have to spend. Thus, he saves the carrying costs but forsakes any dividends. This savings is reflected by the marketplace in that a premium is placed on the price of the futures contract. As a consequence, longer-term contracts trade at a larger premium than do near-term contracts, much as is the case with options. In most cases, however, the index futures trader is concerned with the nearest-term contract, and perhaps the next one out in time.

TERMS OF THE CONTRACT

There are cash-based index futures on several indices, although some of these futures contracts are not heavily traded. The most heavily traded contract is the future on the S&P 500 Index. This contract trades on the Chicago Mercantile Exchange. It has contracts that expire every 3 months (March, June, September, December) and a 1-point

move in the futures contract is worth $250. There is no particular reason why a 1-point move is worth $250, that is merely how the contract is defined. These numbers are subject to change. Originally, a 1-point move in S&P futures was worth $500, but when the S&P advanced so much during the bull market of the 1990's, the point value was halved in order to reduce the trading exposure in trader's accounts. One could surmise that a further bull market advance might cause the number to be reduced again, or possibly a prolonged bear market could result in an increase from $250 back to $500, conceivably.

Example: A futures trader buys 1 March S&P 500 contract at 401.00 (the smallest unit of trading is 0.10 points, a "dime"). The contract rises in price to 403.30. The trader has a profit of 2.30 points, or $575 (2.30 points × $250 per point).

The terms of futures contracts can change as the exchanges on which they are traded attempt to adjust the contracts to he more competitive in the current trading environment. Consequently, the strategist should check with his broker to determine the exact terms of any contract before he begins trading it.

OPEN OUTCRY

Futures contracts trade on listed commodity exchanges. However, the method of trading is different from that used for stocks and options. Futures trade by "open outcry" in rings or pits. Members of the exchange are the only ones allowed to trade on the exchange, of course, just as is the case with stocks and options. If the member is trying to execute a buy order, for example, he would announce his bid out loud (open outcry). Sellers would then respond by either showing him an offer or by selling to him at his bid price. This differs from stocks and options which use the specialist system, in that many people can be buying and selling at once, all over the pit. It also differs from the market-maker system used on some stock options exchanges because anyone can make the market in the commodity pit, not just a designated few traders.

This form of trading can produce some oddities not normally associated with stock or stock option trading. There may be slightly different markets at different places in a large, busy trading pit. Hence a buyer on one side of the pit may be trying to pay a price that is being offered on the other side of the pit, but the two do not trade with each other because of the size of the trading crowd. The buyer might buy on one side of the pit, but the seller on the other side does not sell. Then if the market trades lower, only one of the two will have received an execution even though they were trying to buy and sell at the same price. Thus, one cannot be certain that his futures order is executed unless the market trades through his price. That is, if

one is bidding for futures at a price of 1401.50 and a trade is printed at 1401.40, then he can be certain that he has bought his contracts.

Futures exchange members who trade mainly for their own account from the ring or pit are known as locals." They are somewhat akin to the stock option market-maker in that they may take the other side of public orders. Note, however, that they do not have to make a public market as market-makers do.

MARGIN, LIMITS, AND QUOTES

Futures contracts are traded on margin and are marked to market every day. Generally, the amount of margin required is small in comparison to the total size of the contract, so that there is tremendous leverage in trading futures. Anyone trading the futures must deposit the initial margin amount in his account on the day he initiates the trade. Then at the end of each day, the amount of gain or loss on the contract is computed, and the account is credited if there is a gain or debited if there is a loss. In case of a loss, the trader must add more cash to his account to cover the loss. This daily margin computation is known as maintenance margin. Treasury bills or other securities are good collateral for the initial margin, but the daily variation margin is required in cash.

Example: The S&P 500 futures contract is a cash-based futures contract that trades on the Chicago Mercantile Exchange. Since the contract is settled in cash, there is no actual physical commodity underlying the contract. Rather, the contract is based on the value of the S&P 500 stock index. At the expiration of the contract, each open contract is marked to market at the closing price of the S&P 500 stock index and disappears. All contracts are settled for cash on their final day and then they no longer exist – they expire. The terms of the contract specify that each point of movement is worth $250. Thus, if the S&P 500 Index itself is at 1405, then the S&P futures contract is a contract on $250 × 1405, or $351,250 worth of stocks comprising the index. Assume the initial margin for one of these contracts is $30,000, although it may vary at specific brokerage houses.

Suppose that a trader buys one December S&P futures contract for his account sometime in October. With the underlying index at 1405.00, suppose he pays 1417.50 for the futures contract. It is normal for the futures to trade at a premium to the actual index price. The reasons regarding this will be discussed in a later section. Initially, the customer puts up $30,000 as margin, and this may be in the form of T-bills. On the next day, however, the market declines and the futures close at 1406.00. This represents a loss of 11.50 points from the purchase price. At $250 per point, the trader has a loss of $2,875 (250 × 11.50) at this time. He is required to add $2,875 in cash into the account.

If he continued to hold the contract until expiration, this process of adding his daily gain or subtracting his daily loss from the account would recur each day. Finally, on the last day, the futures contract is deemed to close at the exact opening price of the S&P 500 Index and the variation margin is calculated again at that price. Then the futures contract is expired, so it is "erased" from his account. He is then left with only the cash that he made or lost on the trade of his contract.

The leverage produced by small margin requirements (as a percent of the total value of the contract) is a major factor in making futures very volatile, in dollar terms. In the preceding example, a $30,000 margin investment controls $351,250 worth of stocks. Due to their volatility, many futures contracts trade with a limit. That is, the price can only fluctuate a fixed amount above or below the previous day's closing price. This concept is intended to prevent traders with large positions from being able to manipulate the market drastically in either direction.

S&P and NYSE Expiration. S&P 500 futures expiration occurs in a somewhat complex way, compared to those indices whose options and futures expire at the last sale on the final day of trading. Some years ago, in order to attempt to reduce the volatility that index futures and options expiration was causing in the stock market, the NYSE and the Chicago Mercantile Exchange (where the S&P 500 futures trade) agreed to change the expiration of their index products from the end of trading on the last Friday to the morning of that day. The effect of expiration on the stock market is discussed in the next chapter.

As a result, the S&P futures and futures options as well as futures, futures options, and index options on the New York Stock Exchange Index settle in the following manner on their last day of trading. On expiration day – the third Friday of the month – the "final" price for purposes of settling futures and options is comprised of taking the opening trade of each stock and calculating an index price based on those opening prices. There is no actual trading in the futures and options on that last Friday; they cease trading at the close of trading on the previous day, Thursday.

The purpose of this change was to give the specialists on the New York Stock Exchange more time to line up the other side of trades to handle order imbalances. Under the new rules, index arbitrageurs are forced to enter their buy or sell orders as market on open orders on that last Friday before 9 am EST. The specialist can then take his time in opening the stock if he needs to; he can solicit orders if there is too much stock to buy or sell.

The effect of all this is that the "final" index price for settlement purposes is not known until all the stocks in the index have opened. It may take some time to open all 500 stocks in the S&P 500 Index if there is a volatile market that Friday morning

(perhaps caused by news) or if there are severe order imbalances in many of the stocks (caused by index arbitrageurs). Index arbitrage is described in Chapter 30.

Limits. Originally, index futures traded without limits. However, the stock market crash of 1987 changed that. Certain parties felt that if the futures – which were leading the market down – had ceased trading for a while, the stock market could have stabilized. As a result, a series of trading limits now exists for stock index futures. These are designed to be "circuit breakers" – to prevent a stock market crash. They are not limits in the sense that other futures have limits, but they are similar.

The levels at which these circuit breakers occur may change from time to time, based on the volatility of the stock market and the price levels at which the S&P futures are trading. That is, if the S&P futures are trading at 1500, one can expect wider circuit breakers than if they are trading at 600. These circuit breakers only apply to downside moves by the stock market. The first in the series of circuit breakers usually halts trading for only 10 minutes. After that, if the market trades lower – usually something on the order of a 10% decline – then a longer circuit breaker is instituted for about 30 minutes or so. After that they could open again, and if they reached the next limit down – something probably on the order of 20% – then trading would be halted for a longer time (two hours or so – again, the details depend on the current regulations). If there is any time left in the trading day, they can open again, and trade down to a final limit, at which time trading would be halted for the day. They could not trade any lower that day, although they could trade lower the next day if need be.

There are similar limits imposed by the NYSE on its trading – based on the Dow-Jones Industrial Averages. Those limits don't necessarily line up exactly with the limits on the S&P futures. That fact might cause problems for hedgers should any of these severe downside limits actually occur.

There are actually other "circuit breakers" designed to prevent runaway stock markets, but they are not related to limits on futures trading. They will be described along with index arbitrage and program trading in Chapter 30.

Quotes. While stocks and stock options are always quoted in dimes, or sometimes nickels, such is not the case with futures. Some futures trade in fractions, while others trade in cents. In the coming chapters, there will be many examples of the trading details of futures and options. However, the investor should familiarize himself with the details of an individual contract before beginning to trade it or its options. One's commodity broker can easily supply this information.

There are certain differences between the way futures trade and the way stocks trade. One difference that is extremely important to investors accustomed to dealing in stocks and stock options is that quotation vendors rarely show a bid and offer for futures. Thus, if one uses a quote machine to obtain the price of a stock he might see that the stock is currently 31 bid, 31.10 asked, with a last sale of 31. An active futures contract traded on a trading floor (which is typically the type that one would want to trade) virtually never shows a bid and offer, but rather shows last sale only. In addition, each sale of a stock or stock option is recorded both as to its time of execution and the quantity of execution. Such is not the case for futures. Only the price is recorded – one cannot tell how many contracts traded at the price, nor can he tell if there were repeated sales at that price. Where futures are traded in electronic markets, of course, the bid and offer are available for all to see, and volume may accurately be recorded as well.

OPTIONS ON INDEX FUTURES

As we saw earlier, futures contracts allow a person dealing in a commodity to minimize profit fluctuations in his commodity. The mutual fund manager who sold the futures largely removed any possibility of further upside profit or downside loss. Options, however, allow a little more leeway than futures do. With the option, a person can lock in one side of his position, but can leave room for further profits if conditions improve. For example, the mutual fund manager might buy put options on the S&P 500 Index to hedge his downside risk, but still leave room for upside profits if the stock market rises. This is different from the sale of a futures contract, which locks in his profit, but does not leave any room for further profits if the market moves favorably.

Options trade on many types of futures contracts. The security underlying the option is the futures contract having the same expiration month, not the entity underlying the futures contract itself. Thus, if one exercises a listed futures option, he receives a futures contract position, not the physical commodity.

Example: A trader owns the ZYX futures December 165 call option (165 is the striking price). Assume the ZYX December future closed at 171.20. Both the calls and the futures are worth $500 per point. If the call is exercised, the trader then owns one ZYX December (same expiration month as the option) futures contract at a price of 165. Since the current price is 171.20, there is a maintenance margin credit of $3,100 in his account ($500 \times 6.20$ points). Note that even though the option is an option on a future which is cash-based, the exercise provides the holder of the option with a futures contract position, not with cash.

At the present time, there are futures options on all of the various index futures contracts.

EXPIRATION DATES

Futures options have specifics much the same as stock options do: expiration month (agreeing with the expiration months of the underlying futures contract), striking price, etc. If a trader buys a futures option, he must pay for it in full, just as with stock options. Margin requirements vary for naked futures options, but are generally more lenient than stock options. Often, the naked requirement is based on the futures margin, which is much less than the 20% of the underlying stock price as is the case with listed stock options.

When the futures option has a cash-based futures contract underlying it, the option and the future generally expire on the same day. Thus, if one were to exercise a ZYX option on expiration day, one would receive the future in his account, which would in turn become cash because the future is cash-settled and expiring as well.

Example: Suppose that a trader owns a ZYX December 165 futures worth $500 per point – call option and holds it through the last day of trading. On that last day, the ZYX Index closes at 174.00. He gives instructions to exercise the call, so the following sequence occurs:

1. Buy one ZYX future at 165.00 via the call exercise.
2. Mark the future at 174.00, the closing price. This is a variation margin profit of $4,500 (174.00 – 165.00) × $500.
3. The option is removed from the account because it was exercised, and the future is removed as well because it expired.

Thus, the exercise of the option generates $4,500 in cash into the account and leaves behind no futures or option contracts. We do not know if this represents a profit or loss for this call holder, since we do not know if his original cost was greater than $4,500 or not.

It should be noted that futures option expiration dates, in general, are fairly complex. They are not normally the third Friday of the expiration month, as stock options are. *Index futures options* generally *do* expire on the third Friday of the expiration month, but many physical commodity options do not. These differences will be discussed in the later chapter on futures options.

OPTION PREMIUMS

The dollar amount of trading of a futures option contract is normally the same as that of the underlying future. That is, since the S&P 500 future is worth $250 per point, so are the S&P 500 futures options. The same holds true for the New York Stock Exchange Index options.

Example: An investor buys an S&P 500 December 1410 call for 4.20 with the index at 1409.50. The cost of the call is $1,050 (4.20 × 250). The call must be paid for in full, as with equity options.

An interesting fact about futures options is that the longer-term options have a "double premium" effect. The option itself has time value premium and its underlying security, the future, also has a premium over the physical commodity. This phenomenon can produce some rather startling prices when looking at calendar spreads.

Example: The ZYX Index is trading at 162.00 sometime during the month of January. Suppose that the March ZYX futures contract is trading at 163.50 and the June futures contract at 167.50. These prices are reasonable in that they represent a premium over the index itself which is 162.00. These premiums are related to the amount of time remaining until the expiration of the futures contract.

Now, however, let us look at two options – the March 165 put and the June 165 put. The March 165 put might be trading at 3 with its underlying security, the March futures contract, trading at 163.50. The June 165 put option has as its underlying security the June futures contract. Since the June option has more time remaining until expiration, it will have more time value premium than a March option would. However, the underlying June future is trading at 167.50, so the June 165 put option is $2\frac{1}{2}$ points out-of-the-money and therefore might be selling for $2\frac{1}{2}$. This makes a very strange-looking calendar spread with the longer-term option selling at $2\frac{1}{2}$ and the near-term option selling for 3. This is due to the fact, of course, that the two options have different underlying securities. One is in-the-money and the other is out-of-the-money. These two underlyings – the March and June futures – have a price differential of their own. So the option calendar spread is inverted due to this double premium effect.

FUTURES OPTION MARGIN

Most futures exchanges have gone to the form of option margin called SPAN, which stands for Standard Portfolio Analysis of Risk. This form of margining is very fair and attempts to base the margin requirement of an option position on the probability of

movement by the underlying futures contract, as well as on the potential change of implied volatility of the options in question.

The older method of margining option positions is known as the "customer margin" method. The customer margin method generally results in higher margin requirements. The reader is referred to the chapter on futures and futures options for an in-depth discussion of SPAN and other option margin requirements.

OTHER TERMS

Just as futures on differing physical commodities have differing terms, so do options on those futures. Some options have striking prices 5 points apart while others have strikes only 1 point apart, reflecting the volatility of the commodity. Specifically, for index futures options, the S&P 500 options have striking prices 5 points apart, and the NYSE options have striking prices 2 points apart.

There is no standard method for quoting futures on options as there is with stock options. In some cases, striking price symbols are similar to stock option symbols (A=5, B=10, C=15, etc.), while in others the letters are used incrementally (A=1, B=2, C=3, etc.). Moreover, the method used may differ with each quote vendor. In some cases, quote systems use the *numeric value* of the strike instead of letters. This makes quoting options much simpler, and perhaps the entire industry (including stock option vendors) will adopt this method someday. Since there is no standard method for quoting, one must obtain the symbols individually for futures options, a fact that makes quoting them extremely inconvenient.

There are position limits for some futures options, hut they allow for very large positions. Check with your broker for exact limits in the various futures options.

QUOTES

Most futures option quotes (bids and offers) are not displayed on quote-vending machines, as is also the case with futures. Options traded on the Chicago Mercantile Exchange are the exception. This can he somewhat distressing to the trader used to dealing in stock options, since options are normally far less liquid than the underlying security. It might be acceptable to trade off of last sales in a liquid futures contract, but not so with the options. As a result, futures options have not attracted many stock option traders into their fold. Of course, where electronic markets exist, the bids and offers of options would be shown publicly.

The consequence of the inconsistencies in terms as well as the general unavailability of quotes has been that index futures options are generally traded by professionals, with the public largely ignoring them. This does not mean, however, that

futures options are unworthy of the strategist's time and effort. In fact, just the opposite may be true – the lack of general information may produce some inefficiencies that the strategist can benefit from.

One factor concerning the trading of futures options can be of major concern to many customers and salesmen. Salesmen who are registered to sell stocks are not necessarily registered to sell futures – an additional test must be passed in order to sell many types of futures options. Similarly, many customers – primarily institutions – have received approval from their constituents to trade in stock options, but would need further approvals to trade futures or futures options. Neither of these things should stand in the way of the strategist – if there are opportunities in futures options, then the customer should find a broker who can trade them. Also if the strategist finds that he requires certain approvals from within his own institution before he can trade futures, then he should obtain those approvals.

STANDARD OPTIONS STRATEGIES USING INDEX OPTIONS

The stock option strategies described in all of the preceding chapters of this book can be established with index options as well. The concepts are normally the same for index options as they would be for stock options. If one buys a call at one strike and sells a call at a higher strike, that is a bullish spread; if one sells both a put and a call at the same strike (a straddle), that is a neutral strategy. One uses deltas to determine how many options to sell against the ones that he buys in order to establish a delta neutral strategy. Likewise, he uses the deltas to tell, along the way, how his position is progressing and how to adjust it to keep it delta neutral.

We will not describe these same strategies over again. They have already been described in detail. The risk of early assignment removing one side of a position can alter some strategies. In some cases there are particular advantages or disadvantages with index options and futures. Thus, we will briefly go over some major option strategies, giving details pertaining to their usage as index option strategies.

OPTION BUYING

The most common reason for wanting to buy index options is to take advantage of the diversification that they provide, in addition to the normal advantages that option purchasing provides: leverage and limited dollar risk. Many people feel that it is easier to predict the general market direction than it is to predict an individual stock's direction. This feeling, can, of course, be put to good advantage by buying index options. However, sometimes it is not better to buy the index options. In such cases, it may actually be smarter to purchase a package of individual stock options.

Due to a phenomenon known as volatility skewing, it is possible for index options to have implied volatilities that are out of line with projected index or stock price movements. This phenomenon is discussed in detail in the chapter on advanced concepts.

For example, suppose that index puts are expensive, as they became after the 1987 stock market crash. When this happens it may actually be more profitable for a trader who is bearish on the market to buy a package of equity puts instead of buying index puts. The equity puts are forced to reflect the probability of stock price movement because arbitrage strategies will keep them in line. They will therefore be less expensive than index puts when this type of volatility skewing is present. Index puts can remain expensive for several reasons – primarily excessive demand and inflated margin requirements. In such situations, it is theoretically correct to buy a group of puts on stock options. In fact, one might even hedge this purchase by selling out-of-the money, overpriced index puts.

SELLING INDEX OPTIONS

In earlier chapters, we saw that many mathematically attractive strategies involve the sale of naked options – ratio writes, straddles, ratio spreads, etc. Index options present an even stronger case for these strategies. Recall that the greatest risk in these strategies with naked options is that the underlying security might move a great distance, thereby exposing the position to great loss if the movement is in the direction in which the naked options lie. That is, if one is naked calls and the underlying security rises dramatically, perhaps on a takeover bid, then large losses – potentially unlimited in the absence of follow-up action – could occur.

The strategist would, of course, never let the loss run uncontrolled. He would attempt to take some follow-up action to limit the loss or to neutralize the position. However, even the best strategist cannot hedge his position if the movement in the underlying occurs while the market is closed. For example, if the underlying security is a stock, certain news items might cause a large gap to occur between the closing price of a stock and its next opening price. Such news might be related to a takeover of the company or to a drastically negative earnings report, for example.

Index options do not have this particular drawback. An index – especially a broad-based index – is not as likely to open on a wide gap as a stock is. An index cannot be the subject of a takeover attempt. It cannot be severely depressed by bad earnings on one of its components. Thus, index options are more viable candidates for strategies involving naked option writing than stock options are. Index futures and options may often open on small gaps of a point or so, due to emotion or possibly due to the fact that a market that opens earlier (T-Bond futures, for example) has already

made a rather large move by the time the futures open. Such a small gap is normally not extremely damaging to the naked writer.

One cannot assume that an index can never gap open widely – if something drastic were to happen in the marketplace that caused opening gaps in many stocks, then a gap could appear in the index itself. The worst case of such a gap, percentage-wise, was the stock market crash in 1987 when the major indices such as OEX and S&P 500 opened down over 20 points. Nothing has come close to that before or since, but the possibility always exists that it could happen again. Therefore, one cannot assume that naked option writing of index options is a low-risk strategy; however, it is generally less risky than naked option writing of equity options.

HANDLING EARLY ASSIGNMENT OF CASH-BASED OPTIONS

The greatest problem that a spreader of index options has is the possibility of early assignment. This removes his hedge on one side of his position, exposing him to much more risk than he had wanted or anticipated.

One can often obtain a clue before early assignment occurs by observing the price of the in-the-money options. If they are trading at a discount, one can expect assignment to be more likely.

Example: ZYX is trading at 357 a few days before expiration of the January options. The stock market rallies heavily near the close, and the January 340 calls are trading with a market of $16\frac{1}{2}$ to $16\frac{3}{4}$ after 4 pm EST. Since parity is 17 for these calls, it is likely that a writer will receive an assignment notice in the morning.

The strategist who observes this situation taking place must make a rather quick decision. Since the market has rallied heavily on the close, it is likely that arbitrageurs or institutional accounts who are long index options are going to exercise them. The cynic among us would even think that they might be short stocks as well which they plan to cover in the morning. Notice that the effect of hedged call option sellers (i.e., spreaders) receiving assignment notices will be to make them all long the market. The short side of their spread will have been removed via assignment, and they will be left with only the long side. Therefore, in order to liquidate or hedge, they will have to sell stocks or index futures and options in the morning. This would force the market down temporarily and would be a boon to anyone who was short overnight.

The spreader's first potential choice of action is to notice what is happening near the close of trading and to try to exercise his long calls since he expects assignment of his short calls. The assignment, of course, is not certain – he is merely projecting it. Therefore, he could outfox himself and end up being very short if he did not receive an assignment notice on his short calls.

Assuming the strategist did not anticipate assignment and therefore did not exercise his long calls, he has several choices after receiving an assignment notice the next morning. First, he could do nothing. This would be an overly aggressive bullish stance for someone who was previously in a hedged position, but it is sometimes done. The strategist who takes this aggressive tack is banking on the fact that the selling after the assignment will be temporary, and the market will rebound thereafter, giving him the opportunity to close out his remaining longs at favorable prices. This is an overly aggressive strategy and is not recommended.

The most prudent approach to take when one receives an early assignment on a cash-based option is to immediately try to do something to hedge the remaining position. The simplest thing to do is to buy or sell futures, depending on whether the assignment was on a put or call. If one was assigned on a put, a portion of the bullishness (short puts are bullish) of one's position has been removed. Therefore, one might buy futures to quickly add some bullishness to the remaining position. Generally, if one were assigned early on calls, part of the bearishness of his position would have been removed – short calls being bearish – and he might therefore sell futures to add bearishness to his remaining position. Once hedged, the position can be removed during that trading day, if desired; by trading out of the hedge established that morning.

One should receive this assignment notice early in the morning, so he can immediately hedge his position in the overnight markets. If he waits until the day session opens, he might use futures or options to hedge. One should be particularly careful about placing market orders in an opening option rotation, especially on index options after a severe downside move has occurred the previous day. Market makers are very nervous and are not willing to sell puts as protection to the public in that situation. Consequently, puts are notoriously overpriced after a large down day in the stock market. One should refrain from buying put options in the opening rotation in such a case. In the future, it is possible that comparable situations may exist on the upside. To date, however, all gaps and severe mispricing anomalies have been on the bearish side of the market, the downside.

CONCLUSION

The introduction of index products has opened some new areas for option strategists. The ideas presented in this chapter form a foundation for exploring this new realm of option strategies. Many traders are reluctant to trade futures options because futures seem too foreign. Such should not be the case. By trading in futures options, one can avail himself of the same strategies available in stock option. Moreover, he may be able to take advantage of certain features of futures and futures options that

are not available with stock options. For example, if one were to try to use options to construct a strategy based on his expectation of interest rate movements, he could use T-Bond futures and options, which is the easiest way. However, if he were to try to remain with stock options, he would probably be forced to do something with utility stocks or illiquid interest rate options – a clearly inferior alternative.

Trading in index options can be very profitable, but only if one understands the risks involved – especially the risk of early assignment in cash-based options. The advantages to being able to "trade the market" as opposed to trading one stock at a time are obvious: If one is right on the market, his index option strategies will be profitable. This is superior to stock-oriented buying whereby one might be right on the market, but not make any money because calls were bought on stocks that didn't follow the market.

The strategist should consider all of his alternatives when trading in these markets. If he is bullish, should he really be buying OEX calls? Maybe futures calls on the S&P 500 are better. Perhaps the OEX is expensive with respect to the NYSE and the NYA calls would be a better buy. In fact, perhaps all the calls are so expensive that stock options are the best buy. The ideas presented in this chapter lay the groundwork for the strategist to explore these questions and make the best decision for his investment strategy.

Finally, keep in mind that the index futures and options comprise a very diverse set of securities. They can be put to work for the investor, the trader, and the strategist in a multitude of ways. The only practical limit is in the mind of the user of these derivative securities.

PUT-CALL RATIO

Generally, we have not been concerned with technical trading systems in this book. Not that they aren't important, they are just in another category of investments other than option strategies. However, the put-call ratio system is so closely related to options that its inclusion is worthwhile.

The put-call ratio is simply the number of puts traded divided by the number of calls traded. It can be computed daily, weekly, or over any other time period. It can be computed for stock options, index options, or futures options. Sometimes it is computed using open interest instead of volume. Another way to compute the put call ratio is to divide the *dollars* spent on puts (sum of each put price times its trading volume) divided by the *dollars* spent on calls (sum of each call price times its trading volume). If it is calculated daily, one usually averages several days' worth of figures to smooth out the fluctuations.

Example: The morning paper shows that yesterday the trading activity for OEX options was:

Total OEX Call Volume: 125,000 Contracts
Total OEX Put Volume: 135,000 Contracts

Therefore, the ratio is:

$$\text{Index Put-Call Ratio} = \frac{135{,}000}{125{,}000} = 1.08 \text{ for yesterday}$$

This technical indicator is a contrary one. The contrarian thinking is along these lines: if everyone is buying puts, then everyone must be bearish; if everyone is doing something, they can't all be right; therefore the contrarian must assume a bullish stance.

So, if the put-call ratio is high, too many traders are buying puts; a contrarian would interpret that as a bullish sign. Conversely, if the put-call ratio is low, too many traders are buying calls; the contrarian would consider that as a bearish indicator. The theory behind contrary systems is that the majority of traders are wrong at major turning points in the market.

There are several typical put-call ratios that can be computed. Generally, one would not want to mix different types of options. For example, the equity put-call ratio uses the option trading volume of equity options only. The index put-call ratio uses index options only. Each futures contract put-call ratio is generally computed separately, gold, soybeans, currencies, etc. One might also attempt to screen his input a little further: for example, the index put-call ratio should only include index options on U.S. exchanges; the others can be computed separately.

Obviously, the more highly traded option contracts produce a more reliable put-call ratio: equity options and index options being very liquid. Gold futures options by themselves are not that active and may produce distorted results for a period of time.

The Ratio Itself. Traders and investors almost always buy more calls than puts where stock options are concerned. Therefore, the equity put-call ratio is normally a number far less than 1.00. If call buying is rampant, the equity put-call ratio may dip into the 0.30 range on a daily basis. Very bearish days may occasionally produce numbers of 1.00 or higher. An average day will generally produce a ratio of around 0.50.

Index options, however, produce much larger ratios. Many institutional and other investors are constantly looking to avail themselves of the protective capability of index puts. Therefore, far more index puts are purchased than are equity puts. An average day might produce readings of 2.00 for some indices.

Interpreting the Ratio. There are several philosophies as to how to interpret the ratio once it has been calculated. All philosophies are of the contrarian variety, so the general comments made earlier that high ratios are bullish and low ratios are bearish still hold true. However, quantifying just what is "high" and what is "low" leaves room for interpretation.

One school believes that absolute ratios should be used. An example might be: "if the 10-day moving average of the equity put-call ratio is over 0.60, that is a buy signal." Unfortunately, applying absolute figures to any of the ratios can be counterproductive at times. If the market is in the grip of a prolonged bearish move, more and more puts will continue to be purchased, sending the ratio quite high before it can reverse and start coming back to normal levels. Therefore, it is better to look for the ratios to make a high or a low before calling a buy or sell signal. This is a more dynamic interpretation; it allows for buy and sell signals to come at different absolute levels of the put-call ratio.

Figure 29-1 shows the 50-day equity put-call ratio going back several years (the daily figures for the previous 50 trading days are averaged to produce the number plotted on the chart each day). One can see that at certain times, the put-call ratio reached extreme heights before finally generating a buy signal. Attempting to call a buy on the market at an absolute level would have been an error because the entry point would have come too early. Notice that the readings in late 1990 – as the market bottomed in advance of Operation Desert Storm – were actually higher on an absolute basis than those made after the stock market crash in 1987. Similar observations can be made for sell signals after the ratio has reached low levels: don't anticipate – wait for the ratio to bottom out and turn up before declaring a sell signal or to roll over and turn down before declaring a buy signal.

The index put-call ratio is shown in Figure 29-2. It tells a similar story to the equity ratio, although there are certainly differences – beyond the obvious one that the ratios have different absolute values. Note that this ratio averages about 1.00 while the equity ratio averaged about 0.50.

At times, index put buying becomes extensive even as the market climbs. This does not generally happen with equity options. It seems that institutional money managers, who are long stocks, are afraid that they will lose their profits after a quick stock market advance. However, rather than sell their stocks, they buy puts (possibly overpaying for them). Thus, they are really bullish (they own stocks), but they are buying puts as a hedge.

This is a difficult situation for the contrarian. What is the institutional manager's true bias? Is he bullish because he still owns stocks or is he bearish because he is buying puts? This is the bane of contrary analysis – attempting to accurately interpret the data that is being received. Figure 29-2 shows that the index put-call ratio

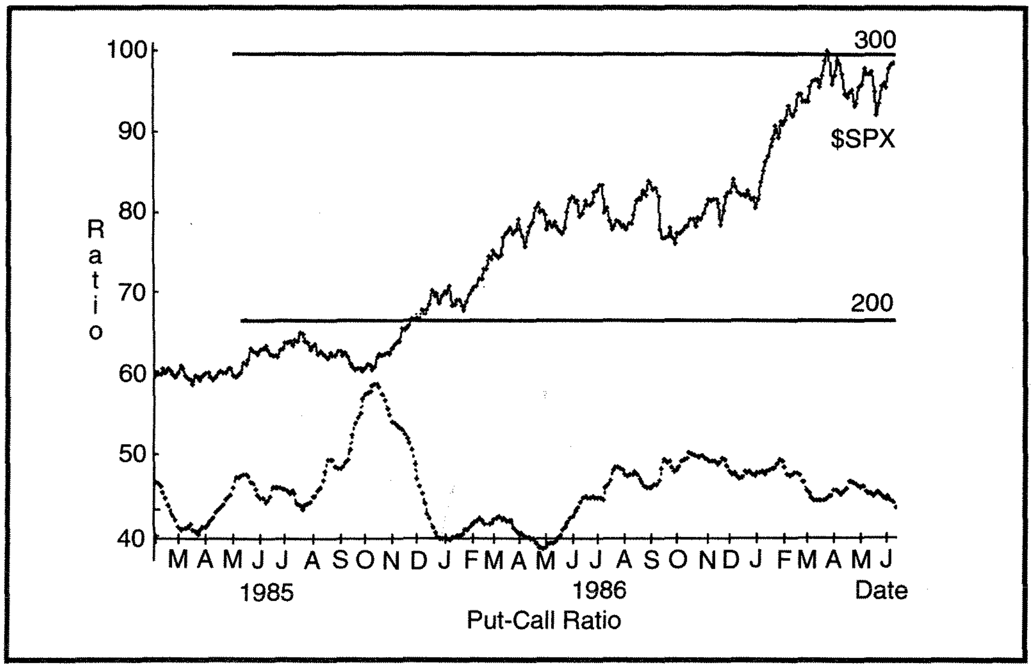
is less reliable than the equity ratio, but is still helpful in determining market tops and bottoms.

In summary, the put-call ratio is an easily calculated one. Daily fluctuations can be smoothed out into 10-, 20-, or 50-day moving averages. The ratio should be interpreted bullishly when there is too much put buying and bearishly when there is too much call buying. The phrase "too much" is not easily interpreted, but looking for local maxima or local minima in the chart pattern is a reasonable way to approach the problem. When the put-call ratio moving average is increasing, a buy signal would not be given until the average rolls over and begins declining; a sell signal would be generated when the average which is declining bottoms out.

SUMMARY

There are several kinds of indices and several kinds of trading vehicles: cash-based options, futures options, and futures. These various underlying securities have differing terms in the way they trade and also in the way their options are designed. This variety creates many opportunities for astute option strategists.

FIGURE 29-1.
50-day equity put-call ratio: 1985–2000.



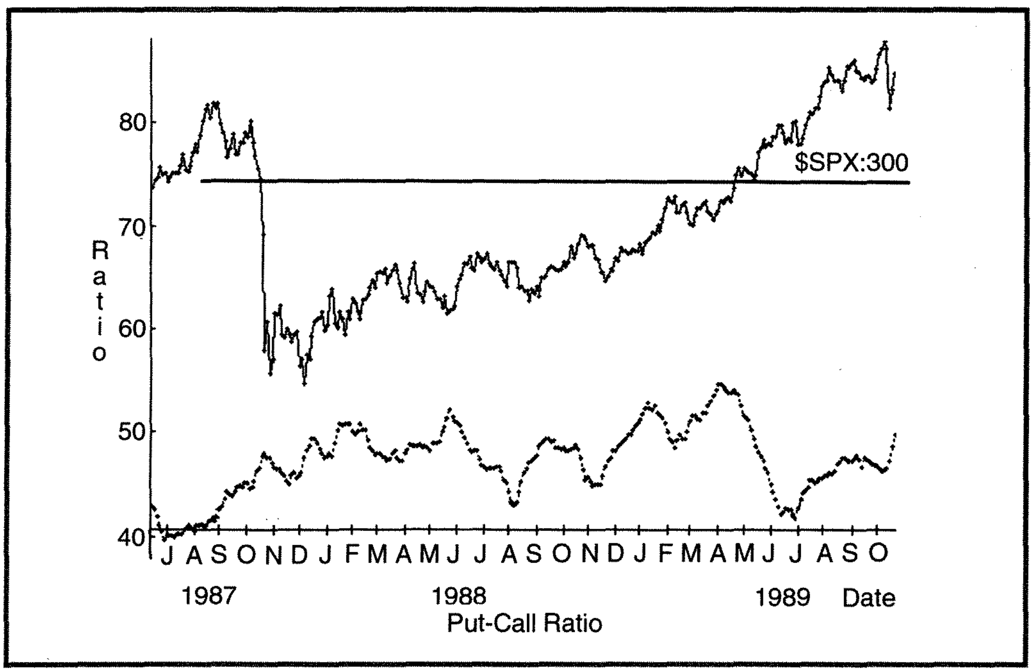


FIGURE 29-1.
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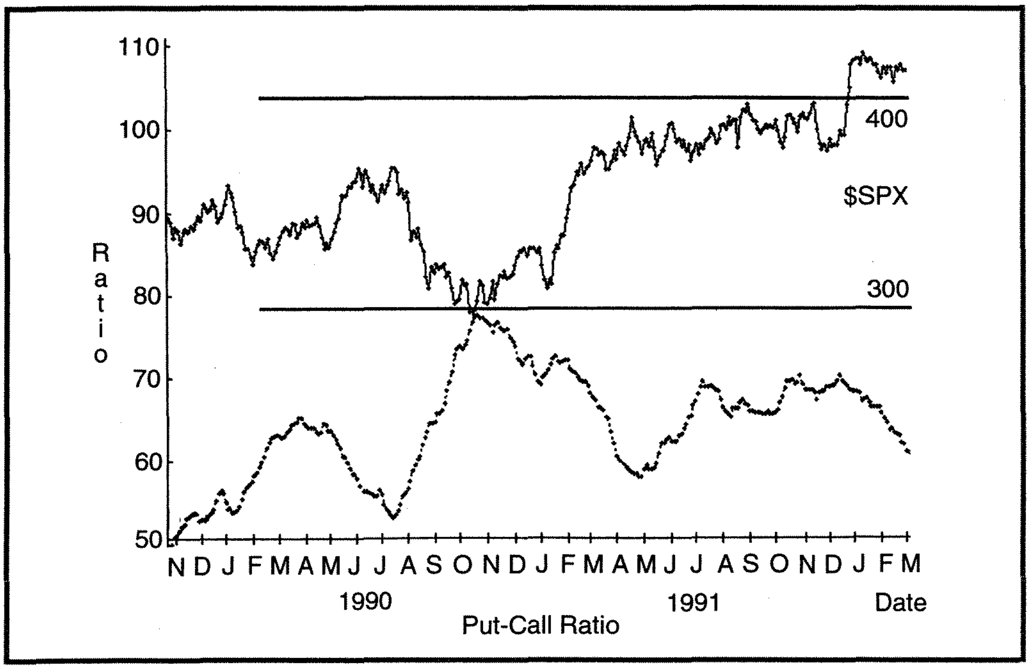

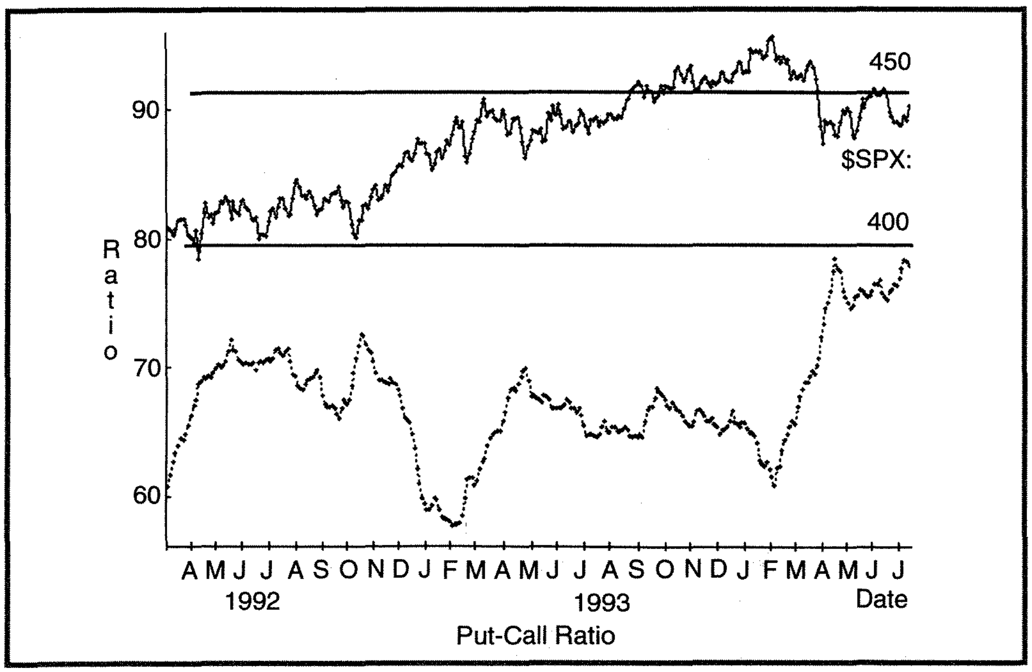

FIGURE 29-1.
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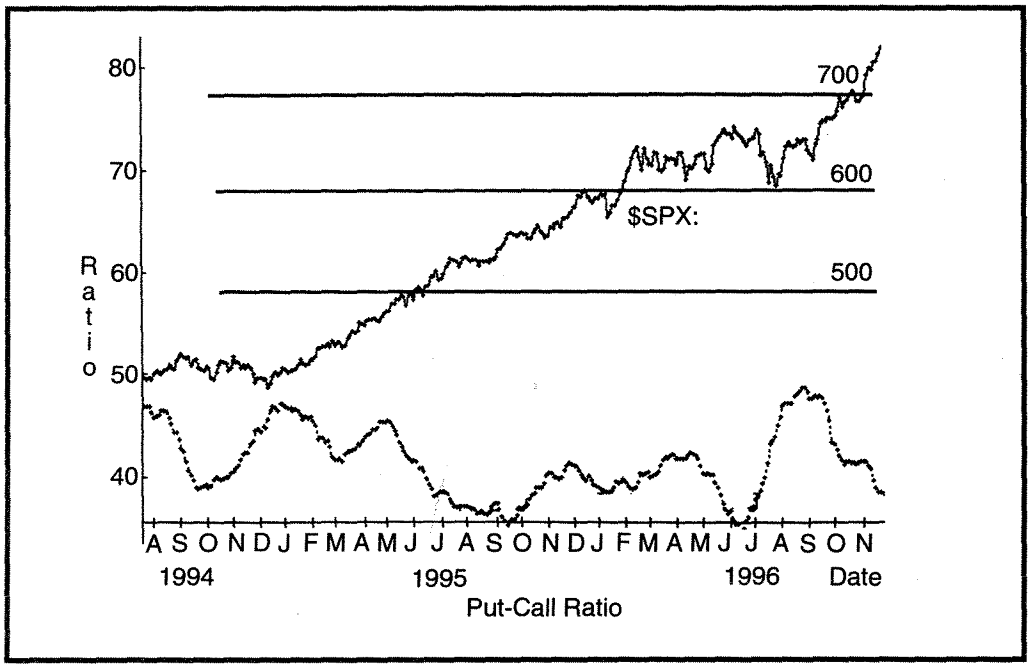

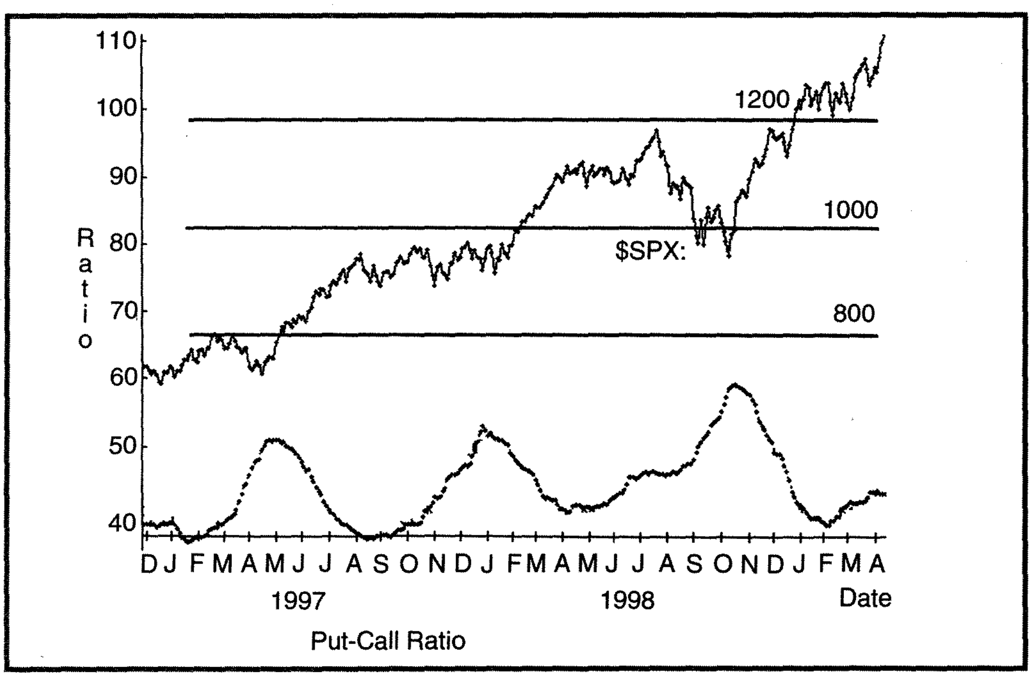

FIGURE 29-1.
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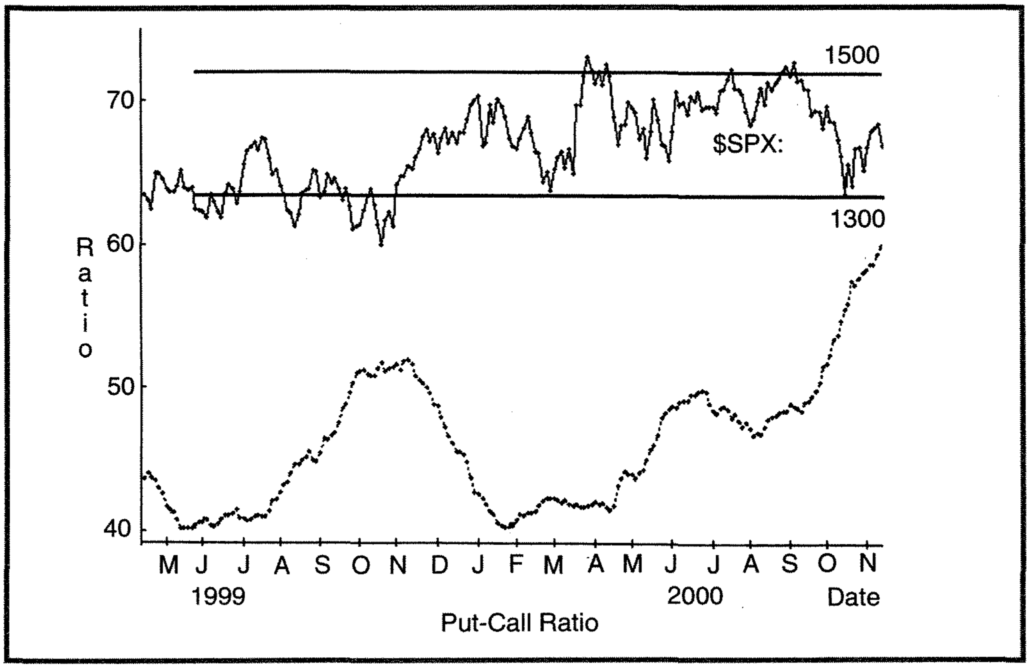

FIGURE 29-2.
50-day index put-call ratio: 1985–91.

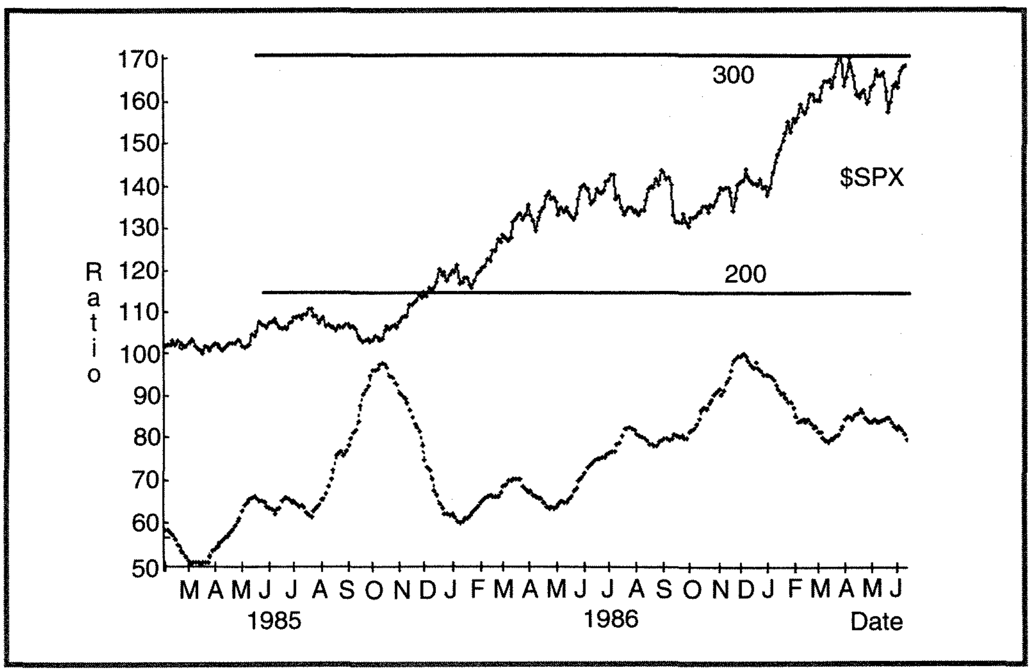

FIGURE 29-2.
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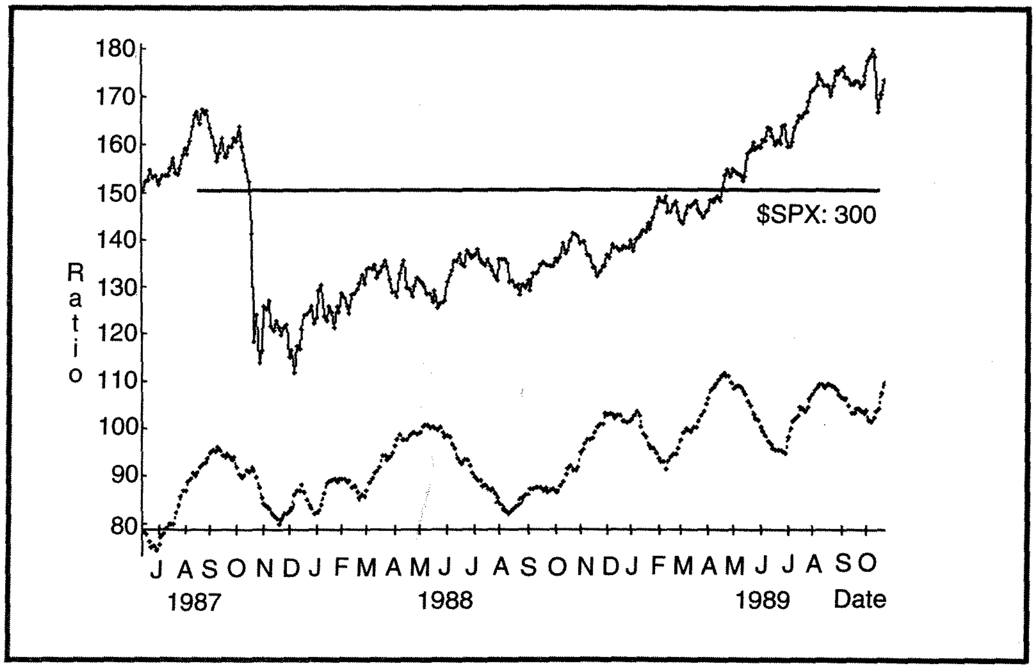

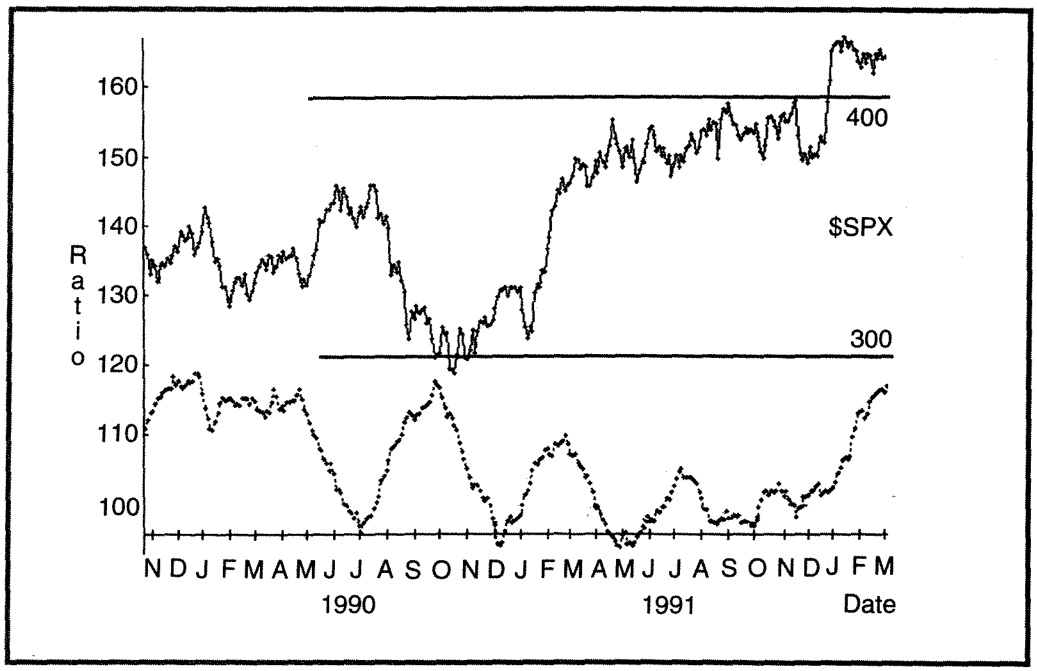

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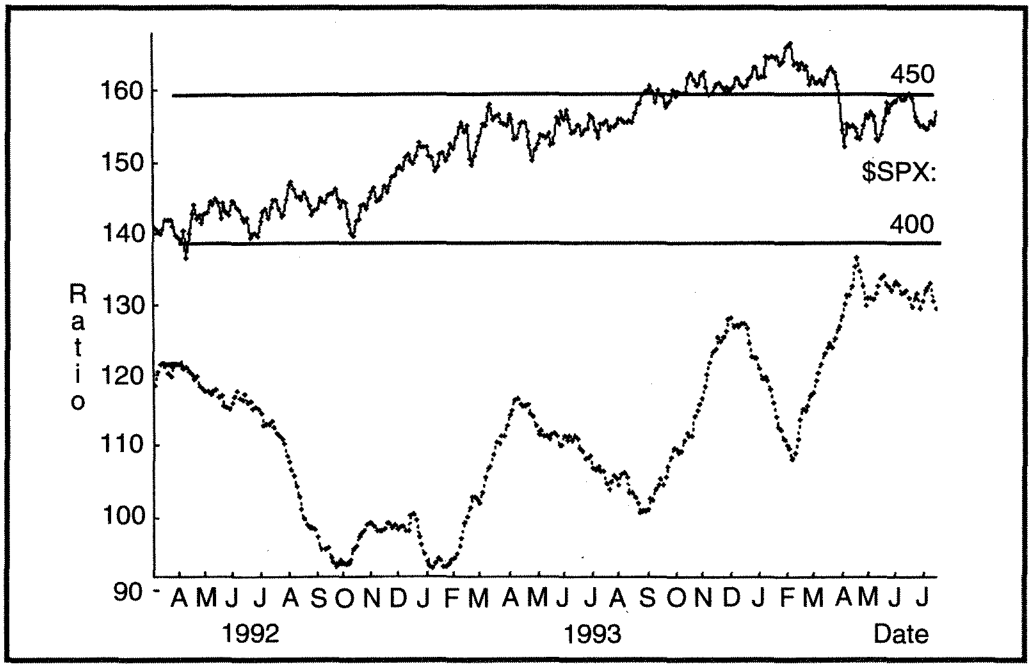

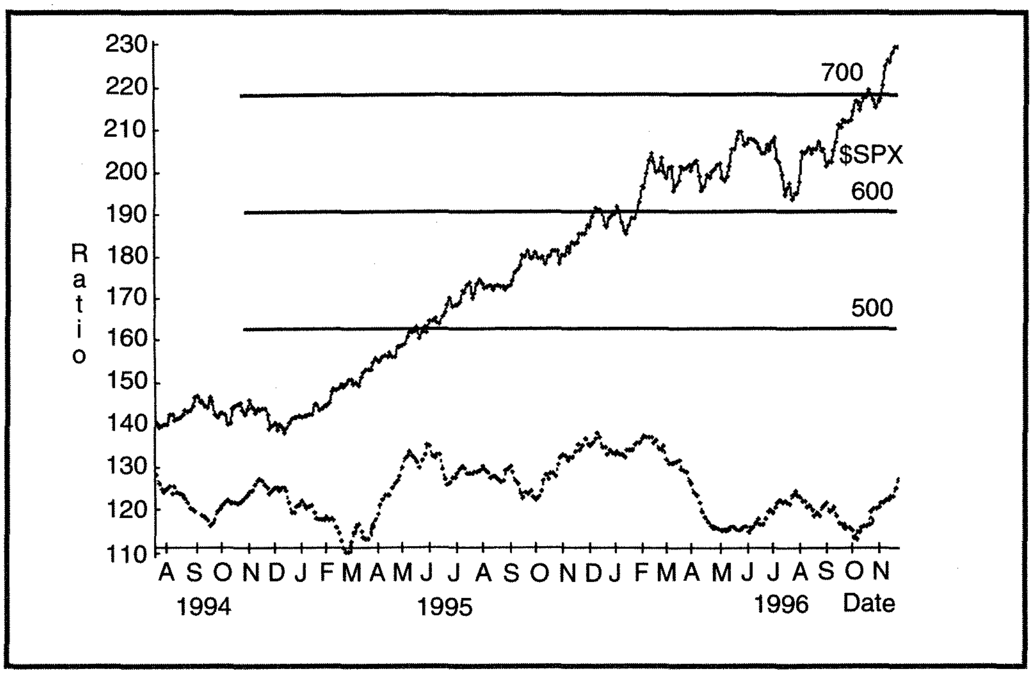

FIGURE 29-2.
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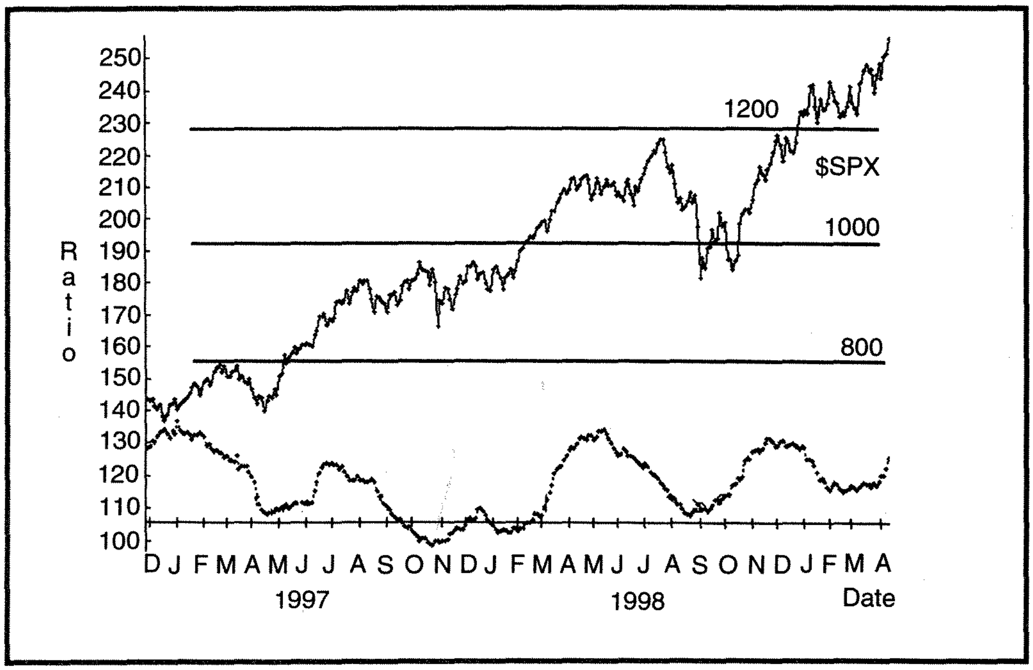

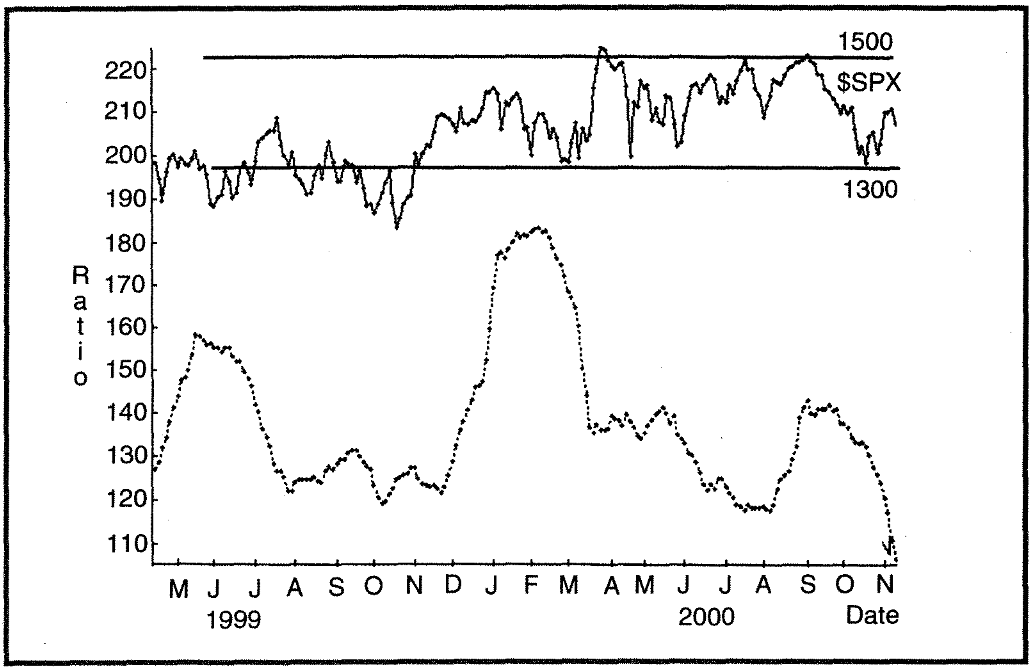

CHAPTER 30

Stock Index Hedging Strategies

This chapter is devoted primarily to examining the various ways that one might hedge a portfolio of stocks with index products. This portfolio might be a small one owned by an individual investor or it might be as large as the entire S&P 500 Index. We explore this strategy from the various viewpoints of the individual investor, the institutional money manager, and the arbitrageur. This technique of hedging stocks with index products has become quite popular and has also drawn some attention because of the way it can cause short-term movements in the entire stock market. The reasons why these movements occur are also explained. Finally, we look at ways of simulating a broad-based index by buying a group of stocks whose performance is geared to that of the index itself.

MARKET BASKETS

One of the most popular strategies using index futures and options has been the technique of buying stocks whose performance simulates the performance of a broader index and hedging that purchase with the sale of overpriced futures or options based on that index. The group of stocks that is purchased is commonly known as a "market basket" of stocks. This chapter describes how these baskets can be used to trade against a very broad index, such as the S&P 500, or a far narrower index, such as the Dow-Jones 30 Industrials (DJX), or even one as small as just a few stocks – perhaps a portfolio held by any investor.

The key to determining whether it will be profitable to trade some derivative security – options or futures – against a set of stocks is generally the level of premium in the futures contract itself. That is, if the S&P 500 Index is at 405.00 and the futures are trading at 408.00, then there is a premium of 3.00 – the futures contract is trading 3.00 points higher than the index itself. The absolute level of the premium is not what is important, but rather the relationship between the premium and the fair value of the future. We will look at how to determine fair value shortly.

The futures are the leaders among the derivative securities, especially the S&P 500 futures. Whenever these become overpriced, other derivative securities will generally follow suit. There are also futures on the NYSE Index, the Value Line Index, and the Japanese Nikkei 225 Index. Moreover, there are cash-based index options on the S&P 500 Index (as opposed to the futures options on that index) and the NYSE Index. These other securities would include the QEX (S&P 100) options and NYSE futures and options. It follows as well that when the S&P 500 futures become underpriced, the other derivative securities quickly fall into line. If the other derivative securities don't follow suit, then there is an opportunity for spreading one market against another. That type of spreading can frequently be profitable, and is discussed in the next chapter.

The normal scenario is for most of the derivative securities to follow the lead of the S&P 500 futures. When this happens, the only thing that is fairly priced is the index itself – that is, stocks. Consequently, the logical way to hedge the derivative security is to do it with stocks. The small investor might hedge his own individual portfolio, although that would not be a perfect hedge since his own portfolio is not composed of the exact same stocks as any index. If the index is small enough, such as the 30-stock DJX, then one might buy all 30 stocks and sell the futures when they are overpriced. This is a complete hedge and would, in fact, be an arbitrage. In the case of a larger index such as the S&P 500, it would be possible only for the most professional traders to buy all 500 stocks, so one might buy a smaller subset of the index in hopes that this smaller set of stocks will mirror the performance of the index well enough to simulate having bought the entire index. We take in-depth looks at both types of hedging.

Even if the investor is not planning to use these hedging strategies, it is important for him to understand how they work. These strategies have certain ramifications for the way the entire stock market moves. In order to anticipate these movements, a working knowledge of these hedging strategies is necessary. The first thing that one must know in order to implement any of these hedging strategies is how to determine the fair value of a futures contract.

FUTURES FAIR VALUE

The formula for calculating the fair value of the futures contract is extremely simple, although one of the factors is a little difficult to obtain information on. First, let's look at the simple futures fair value formula:

Simple Formula:

$$\text{Futures fair value} = \text{Index} \times [1 + \text{Time} \times (\text{Rate} - \text{Yield})]$$

where *index* is the current value of the index itself, *rate* is the current carrying rate (typically, the broker loan rate), *yield* is the combined annual yield of all the stocks in the index, and *time* is the time, in years, remaining until expiration of the contract.

Example: Suppose the ZYX Index is trading at 160.00, the broker loan rate is 10%, the yield on the 500 stocks is 5%, and there are exactly 3 months remaining until expiration of the futures contract. The time is .25, expressed in years, so the formula becomes

$$\begin{aligned}\text{Future fair value} &= 160.00 \times [1 + .25 \times (.10 - .05)] \\ &= 160.00 \times (1 + .0125) = 162.00\end{aligned}$$

Thus, the future should be trading at about 2 points above the value of the index itself. This premium of the future over the index represents the savings in not having to pay for and carry 500 stocks, less the loss of the dividends on the stocks (the future does not pay dividends). If the future should get very expensive – trading at 3.50 or 4 points over the index – then it would have to be considered very overvalued, and an arbitrageur could move in to take advantage of that fact. Similarly, if the future should trade cheaply, at less than a point over fair value, there might be an arbitrage available in that case as well.

The fair value is really only a function of four things: the value of the index itself, the time remaining until expiration, the current carrying rate, and the dividends being paid by the stocks in the index until expiration. Notice that "the dividends paid by the stock in the index until expiration" is not quite the same as the yield of the 500 stocks, which we used in the above simple formula. We will expand more on that difference shortly.

Before doing that, however, let us look at how changes in the variables in the formula affect the fair value of the futures contract. More important, we are interested in how changes in the variables affect the *premium* of the futures contract over the index value. This is what one is primarily concentrating on when trading market baskets.

As the index value itself rises, the fair value premium rises. For example, if 2 points is the fair premium when the index is at 160, as in the above example, then 4

points would be the fair premium if the index were at 320 and all the other variables remained the same. Conversely, as the index falls, the fair value of the premium shrinks.

The premium rises and falls in direct correlation with the carrying rate as well as with time remaining until expiration. Note that this statement is true for stock options also, and for the same reason: The savings in carrying costs are greater when rates are higher, or when one must hold for a longer time, or both. In the above example, if one were to assume there were 6 months to expiration instead of 3, the fair value of the premium would increase to 4 points from 2 points. Similarly, if the time were decreased, the fair value would be smaller.

Some investors, primarily institutional investors, use the short-term T-bill rate rather than the carrying rate in order to determine the futures fair value. The reason they do that is to determine whether the money they have in cash is better off in T-bills or in an arbitrage strategy such as this. More will be said about this use of the T-bill rate later.

Dividends Have an Inverse Correlation to the Premium Value. An increase in the overall yield of the index will shrink the fair value of the futures contract. This is because the futures holder does not get the dividends and therefore the future is not as valuable because of the loss of dividends. Conversely, if dividend yields fall, then the fair value of the premium increases. This is not the whole story on dividends, however.

Recall that a few paragraphs ago, it was pointed out that the yield and the amount of dividends are not exactly the same thing. This is because stocks don't pay their dividends in a uniform manner. Rather than paying a continuous yield as bonds do, stocks normally pay their dividends in four lump sums a year. This means that the yield variable in the simple formula shown above should be replaced by the actual amount of dividends remaining until expiration. This fact makes the computation of the fair value of the index a little more difficult. In order to do it accurately, one must know the dividend amounts and ex-dividend dates of each of the stocks in the index. Knowing all of this information is a far more formidable task than knowing the yield of the index, since the yield is published weekly in several places. In fact, the services of a computer are required in order to compute the actual dividend on the larger indices, where 100 or more stocks are involved.

As a result, the actual formula changes slightly from the simple formula shown above:

Actual Formula:

$$\text{Futures fair value} = \text{Index} \times (1 + \text{Time} \times \text{Rate}) - \text{Dividends}$$

In this formula, *the dividends are taken to be the present worth of all the dividends remaining until expiration of the future.*

Example: In an example similar to the one given for the simple formula, suppose the ZYX Index is trading at 160.00, the broker loan rate is 10%, the present worth of the dividends remaining until expiration is $1.89, and there are exactly 3 months remaining until expiration of the futures contract. The time is .25, expressed in years, so the formula becomes

$$\begin{aligned}\text{Future fair value} &= 160.00 \times (1 + .25 \times .10) - 1.89 \\ &= 160.00 \times (1 + .025) - 1.89 = 162.11\end{aligned}$$

In order to compute the present worth of the dividends of an index, it is necessary to know the amount of each stock's dividend as well as the payment date of the dividend. To compute the index's dividend, one computes the present worth of each dividend and multiplies that result by that stock's divisor in the index in order to give the dividend the proper weight. The index's total dividend is the sum of each of these individual stock computations. Each stock's divisor is merely the float of the stock divided by the divisor of the index. In a price-weighted index, it is not necessary to adjust the present worth of each dividend – merely add them together and divide by the divisor. As an example, we will look at a hypothetical index composed of three stocks in order to see how one computes the present worth of an index's dividends.

Example: Suppose a capitalization-weighted index is composed of three stocks: AAA, BBB, and CCC. Furthermore, suppose that the amount of each of the individual stocks' dividends and the time remaining until the dividend is paid are given in the following table, as well as each stock's float. Finally, assume the divisor for the index is 150,000,000.

Stock	Dividend Amount	Days until Dividend Payout	Float
AAA	1.00	35	50,000,000
BBB	0.25	60	35,000,000
CCC	0.60	8	120,000,000
Divisor: 150,000,000			

In order to compute the present worth of a future amount, one uses the formula:

$$\text{Present worth} = \frac{\text{Future amount}}{(1 + \text{Rate})^{\text{Time}}}$$

where rate is the current short-term rate and time is expressed in years.

Assume that the current interest rate is 10%. Then the present worth of AAA's dividend would be:

$$\text{Present worth AAA} = \frac{1.00}{(1 + .10)^{(35/360)}}$$

$$= \frac{1.00}{(1.10)^{(.0972)}}$$

$$= \frac{1.00}{1.0093}$$

$$= 0.9908$$

The present worth of the dividend is always less than the actual dividend. The present worth of an amount is the amount of money that would have to be invested today at the stated rate (10% in this example) to produce the future amount. That is, 99.08 cents invested at 10% would be worth exactly 1.00 in 35 days.

The present worth of the other two dividends is .2461 for BBB and .5987 for CCC. The reader should verify for himself that these are indeed the correct amounts. Notice that the present worth of a dividend is not much less than the actual value of the dividend. However, in a larger index, where one is dealing with several hundred dividends, the present worth may be significantly different from the actual sum of the dividends, especially if short-term rates are high.

Since we made the assumption that this is a capitalization-weighted index, each of these figures must be adjusted for the capitalization of the stock in order to give each present worth the proper weight within the index. Thus, for AAA, the adjusted dividend would be .9908 times 50,000,000 (AAA's float), divided by 150,000,000, the divisor of the index. This would result in an adjusted dividend of .3303 for AAA. When similar adjustments are made for BBB and CCC, their adjusted values become .0574 and .4790, respectively.

Thus, the present worth of the dividend for the index would be the sum of the three individual adjusted present worths, or .3303 + .0574 + .4790 = $0.8667.

Note: If the index were a price-weighted index, the index's dividend would be the sum of these three present worths (.9908 + .2461 + .5987), divided by the divisor of that index.

The above fair value formula can be applied to options as well. For example, the QEX Index does not have futures. However, the fair value calculations can be done in the same manner, and the synthetic index then constructed by using puts and calls can be compared with that fair value.

Example: Suppose that OEX is trading at 364.50 and a September OEX future – if one existed – would have a fair value of 367.10. That is, the future would command a premium of 2.60. Not only should a future trade with that theoretical premium, but so should the "synthetic OEX" composed of puts and calls at the same strike. Hence, the synthetic OEX constructed with options should trade at about 367.10 also.

That is, if the OEX Sep 365 call were selling for 4.60 and the Sep 365 put were selling for 2.50, then the synthetic OEX constructed by the use of these two options would be priced at 367.10. Recall that one determines the synthetic cost by adding the strike, 365, to the call price, 4.60, and then subtracting the put price: 365 + 4.60 – 2.50 = 367.0. This synthetic price of 367.10 is literally the same as the theoretical futures price of 367.10.

The same calculations can be applied to any index with listed options trading. Let us now return to the broader subject at hand – trading market baskets of stocks against futures.

PROGRAM TRADING

Two terms that conjure up images of the stock market crash in 1987 and other severe price drops are "program trading" and "index arbitrage." Neither one by itself should affect the stock market, since they are two-sided strategies – involving buying stocks and selling futures. This two-sided aspect should have little effect on the market, theoretically. However, in practice, it is often the case that trades are not executed simultaneously, and the stock market takes a jump or a dive.

Program trading is nothing more than trading futures against a general stock portfolio. Index arbitrage is trading futures against the exact stocks that comprise an index.

Later discussions will assume that one is trying to create or simulate the index itself in order to hedge it with futures. This is the arbitrage approach. However, there are many other types of stock positions that may be hedged with the futures. These might include a portfolio of one's own construction containing various stocks, or might include a group of stocks from which one wants to remove "market risk." Normally, one would not own the makeup of any index, but rather would have a unique combination of stocks in his portfolio. Such an investor may want to use futures to hedge what he does own.

One reason why an investor who owned stocks would want to sell index products against them might be that he has turned bearish and would prefer to sell futures rather than incur the costs involved with selling out his stock portfolio (and repurchasing it later). Commission charges are quite small on futures transactions as com-

pared to an equal dollar amount of stock. By selling the futures on an index – say, the S&P 500 – he removes the "market risk" from his portfolio (assuming the S&P 500 represents the "market"). What is left over after selling the futures is the "tracking error." The discrepancy between the movement of the general stock market and any individual portfolio is called "tracking error." This investor will still make money if his portfolio outperforms the S&P 500, but he will find that he did not completely eliminate his losses if his portfolio underperforms the index. Note that if the market goes up, the investor will not make any money except for possible tracking error in his favor.

REMOVING THE MARKET RISK FROM A PORTFOLIO

Stock portfolios are diverse in nature, not necessarily reflecting the composition of the index underlying the futures contracts. The characteristics of the individual stocks must be taken into account, for they may move more quickly or more slowly than "the market." Let us spend a moment to define this characteristic of stocks that is so important.

VOLATILITY VERSUS BETA

Recall that when we originally defined volatility for use in the Black–Scholes model, we stated that Beta was not acceptable because it was strictly a measure of the correlation of a stock's performance to that of the stock market and was not a measure of how fast the stock changed in price. Now we are concerned with how the stock's movement relates to the market's as a whole. This is the Beta.

Unfortunately, Beta is not as readily available to the option strategist as is volatility. Many option traders merely have to punch a button on their quote machines and they can receive estimates of volatility. However, Beta estimates are more difficult to obtain, and the ones that are available are often for very long time periods, such as several years. These long-term Betas cannot be used for the purposes of the index hedging discussed in this chapter. Therefore, if one does not have access to shorter-term Beta calculations, then he can approximate Beta by comparing an individual stock's volatility with the market's volatility.

Example: XYZ is a relatively volatile stock, having both an implied and historical volatility of 36%. The overall stock market has a volatility of 15%. Therefore, one could approximate the Beta of XYZ as

$$\text{Beta approximation} = 36/15 = 2.40$$

There are certain situations in which this approximation would not work well, because the stock has little or no correlation to the overall stock market (e.g., gold or oil stocks). If one has a portfolio of stocks of that type, then he should make a serious attempt to attain their Betas, for the Beta estimate method just described will not be accurate. Such stocks may be volatile – that is, they change in price fairly rapidly – but they may go in totally different directions from the overall stock market: They would thus have high volatility, but low Beta. This is not conducive to the above short-cut for approximating Beta from volatility.

The remaining examples in this chapter use the terms *Beta* and *adjusted volatility* synonymously. Adjusted volatility is merely the approximation of Beta from volatility as described above: the stock's volatility divided by the market's volatility.

THE PORTFOLIO HEDGE

In attempting to hedge a diverse portfolio, it is necessary to use the Beta or adjusted volatility because one does not want to sell too many or too few futures. For example, if the portfolio were composed of nonvolatile stocks and one sold too many futures against it, one could lose money if the market rallied, even if his portfolio outperformed the market. This would happen because the general market, being more volatile, would rally farther than the nonvolatile portfolio. Ideally, one should sell only enough futures so that there would be no gain or loss if the market rallied. There would be only tracking error. Conversely, if one does not sell enough futures against a volatile portfolio, then there is risk of loss if the market declines, since the portfolio would decline faster than the market.

The Beta or adjusted volatility of each stock is used in order to determine the proper number of futures to sell against the portfolio. The dollar value (capitalization) of each stock in the index is adjusted by that stock's volatility to give an "adjusted capitalization" for each stock. Then, when all these are added together, one will have determined how much "adjusted capitalization" must be hedged with futures. The suggested method, described in the following example, uses an adjusted volatility for each stock.

The steps to follow in determining how many futures to sell against a diverse portfolio of stocks are as follows:

1. If you don't know the Beta, divide each stock's volatility by the market's (S&P 500) volatility. This is the stock's adjusted volatility.
2. Multiply the quantity of each stock owned by its price and then multiply by the adjusted volatility from step 1. This gives the adjusted capitalization of the stock in the portfolio.

3. Add the results from step 2 together for each stock to get the total adjusted capitalization of the portfolio.
4. Divide the sum from step 3 by the index price of the futures to be used and the unit of trading for the futures ($500 per point for the S&P 500 futures) to determine how many futures to sell.

Example: Suppose that one owns a portfolio of three diverse stocks: 3,000 GOGO, an over-the-counter technology stock; 5,000 UTIL, a major public utility stock; and 2,000 OIL, a large oil company. The owner of this portfolio has become bearish on the market and would like to sell futures against the portfolio. He needs to determine how many futures to sell.

The prices and volatilities of these stocks are given in the following table. Assume that the volatility of the fictional ZYX Index is 15%. This is the "market's volatility" that is divided into each stock's volatility to get its adjusted volatility (step 1, above).

Stock	Volatility	Adjusted Volatility (Step 1)	Price	Quantity Owned	Adjusted Capitalization (Step 2)	
GOGO	.60	4.00	25	3,000	$300,000	
UTIL	.12	0.80	60	5,000	240,000	
OIL	.30	2.00	45	2,000	180,000	
Total adjusted capitalization:					$720,000	(step 3)

Now suppose that the ZYX Index is trading at 178.65 and a 1-point move in the futures is worth $500. Step 4 can now be calculated: $720,000 ÷ 500 ÷ 178.65, or 8.06 futures contracts. Thus, the sale of 8 futures contracts would adequately hedge this diverse portfolio.

There is an important nuance in this simple example: *The price of the index should be used in all hedging calculations, as opposed to using the price of the future.* There are many examples of hedging portfolios and market baskets with futures or options in this chapter and the next. Regardless of the situation, the value of the index should always be used to determine how much stock to buy or how much of the derivative security to sell.

Note that the actual capitalization of the above example portfolio was only $465,000 ($75,000 for GOGO, $300,000 for UTIL, and $90,000 for OIL). However, the portfolio is more volatile than the general market because of the presence of the two higher-volatility stocks. It is thus necessary to hedge $720,000 worth of "market,"

or adjusted capitalization, in order to compensate for the higher volatility of the portfolio.

A similar process can be used for far larger portfolios. The estimate of volatility is, of course, crucial in these calculations, but as long as one is consistent in the source from which he is extracting his volatilities, he should have a reasonable hedge. There is no way to judge the future performance of a portfolio of stocks versus the ZYX Index. Thus, one has to expect a rather large tracking error. In this type of hedge, one hopes to keep the tracking error down to a few *percent*, which could be several points in the futures contracts over a long enough period of time. Of course, the tracking error can work in one's favor also. The main point to recognize here is that the vast majority of the risk of owning the portfolios has been eliminated by selling the futures contracts. The upside profit potential of the portfolios has been eliminated as well, but the premise was that the investor was bearish on the market.

Note that if the futures are overpriced when one enacts his bearishly-oriented portfolio hedge, he will gain an additional advantage. This will act to offset some negative tracking error, should such tracking error occur. However, there is no guarantee that overpriced futures will be available at the time that the investor or portfolio manager decides to turn bearish. It is better to sell the futures and establish the hedge at the time one turns bearish, rather than to wait and hope that they will acquire a large premium before one sells them.

HEDGING PORTFOLIOS WITH INDEX OPTIONS

As mentioned earlier, one could substitute options for futures wherever appropriate. If he were going to sell futures, he could sell calls and buy puts instead. In this section, we are also going to take a more sophisticated look at using index options against stock portfolios.

First, let us examine how the investor from the previous example might use index options to hedge his portfolio.

Example: Suppose that an investor owns the same portfolio as in the previous example: 3,000 GOGO, 5,000 UTIL, and 2,000 OIL. He decides to hedge with index UVX, which has options worth $100 per point. Assume that the volatility of the UVX is 15%. This investor would then compute his total adjusted capitalization in the same manner as in the previous example, again arriving at a figure of $720,000.

Suppose that the UVX Index is at 175.60. This investor would want to hedge his $720,000 of adjusted capitalization with 4,100 "shares" of UVX ($720,000 ÷ 175.60). Since a 1-point move in UVX options is worth $100, this means that one would sell 41 UVX calls and buy 41 UVX puts. He would probably use the 175 strike or possi-

bly the 180 strike, since those strikes are the ones whereby the calls have the least chance for early assignment.

Where short options are involved, as with the calls in the above example, one must be aware of the possibility of early assignment exposing the portfolio. Consequently, if the marketplace has an equal premium on the futures and the "synthetic" UVX, one should sell the futures in that case, because there is no possibility of unwanted assignment. However, if the options represent a synthetic price that is more expensive than the futures, then using the options may be more attractive.

Example: Suppose that our same investor has decided to hedge his portfolio with its $720,000 of adjusted capitalization. He is indifferent as to whether to use the ZYX futures or the UVX options. He will use whichever one affords him the better opportunity. The following table depicts the prices of the securities that he is considering, as well as their fair values.

Security	Current Price	Fair Value	Index Price
ZYX Jun Future	180.50	180.65	178.65
UVX Jun 175 Call	5	5	175.60
UVX Jun 175 Put	2	2½	175.60
UVX Jun 180 Call	2½	2½	175.60
UVX Jun 180 Put	4½	5	175.60

This investor essentially has three choices: (1) to use the ZYX futures, (2) to use the UVX options with the 175 strike, or (3) to use the UVX options with the 180 strike. Notice that the ZYX future is trading 15 cents below its fair value (180.50 vs. 180.65). The UVX Index fair value, as shown by the fair values of the options, is 177.50. This can be computed by adding the call price to the strike and subtracting the put price. In the case of either strike, the fair values indicate a UVX Index fair value of 177.50.

However, the actual markets are slightly out of line. When using the actual prices, one sees that he can sell the UVX Index synthetically for 178.00 whether he uses the 175's or the 180's. Thus, by using the UVX options he can sell the UVX "future" synthetically for ½ point over fair value, while the ZYX futures would have to be sold at 15 cents under fair value. Thus, the options appear to be a better choice since 65 cents (the 50 cents that the UVX options are overvalued plus the 15 cents that the futures are undervalued) is probably enough of an edge to offset the possibility of early assignment.

With the futures having been eliminated as a possibility, the investor must now choose which strike to use. Since he will be selling calls and buying puts, and since either strike allows him to synthetically sell the UVX "future" at 178, he should choose the 180 strike. This should be his choice because the 180 calls are out-of-the-money and thus less likely to be the object of an early assignment.

HEDGING WITH INDEX PUTS

Let us now move on to discuss ways of hedging in which a complete hedge is not established, but rather some risk is taken. The main difference between options and futures is that futures lock in a price, while options lock in a worst-case price (at greater cost) but leave room for further profit potential. To see this, consider a long stock portfolio hedged by short futures. In this case, one eliminates his upside profit potential except for positive tracking error. However, if he buys put options instead, he expends money – thereby incurring a greater cost to himself than if he had used futures – but he still has profit potential if the market rallies.

One could hedge a long stock portfolio with options by either buying index puts or selling index calls. Buying the puts is generally the more attractive strategy, especially if the puts are cheap. In order to properly establish the hedge, it is not only necessary to adjust the dollars of stock in accordance with the Beta, but the deltas of the options must be taken into account as well. The following example will demonstrate the use of puts to hedge a portfolio of diverse stocks.

Example: Assume that an investor has the same portfolio of three stocks that was used in a previous example: 3,000 GOGO, 5,000 UTIL, and 2,000 OIL. He has become somewhat bearish on the market in general and would like to hedge some of his downside risk. However, he decides to use puts for the hedge just in case there is a further rally in the market.

The table from the earlier example is reprinted below, showing the adjusted volatilities and capitalizations for each stock in the portfolio. The total adjusted capitalization of the portfolio is $720,000, as before.

Stock	Volatility	Adjusted Volatility (Step 1)	Price	Quantity Owned	Adjusted Capitalization (Step 2)	
GOGO	.60	4.00	25	3,000	$300,000	
UTIL	.12	0.80	60	5,000	240,000	
OIL	.30	2.00	45	2,000	180,000	
Total adjusted capitalization:					$720,000	(step 3)

There are two ways that one might want to approach hedging this $720,000 portfolio with puts.

1. As disaster insurance: Buy enough (out-of-the-money) puts so that the portfolio would be 100% hedged below the striking price of the puts.
2. As a hedge against current market movements: Buy enough puts so that all current portfolio movements are hedged.

Example – Method 1: In this method, the portfolio manager is looking for disaster insurance. He is not so much concerned with hedging current market movements as he is with preventing a major loss if the market should collapse. The manager often uses an out-of-the-money put for disaster insurance.

Assume that he is going to use the UVX Index puts, which are worth $100 per point. The March 170 puts, trading at 1, are going to be used in the hedge. The index is currently at 178.00.

He would therefore divide his portfolio's adjusted capitalization ($720,000) by the value of the striking price of the puts to be used. In this case, the value of the striking price is $17,000 (100 × 170).

Puts to buy = $720,000 / $17,000 = 42.3

Cost of 42 puts: $4,200
Striking value of 42 puts: $714,000 (42 × $17,000)

The cost of buying 42 puts is $4,200. This can be thought of as an insurance premium, paid to buy $714,000 worth of insurance. He will have market risk on his portfolio between the current price of the index (178.00) and the striking price (170.00). The 42 puts would hedge a little of the drop in his portfolio during that 8-point drop in the index, but their full protective value would not be felt until they were in-the-money. It is not an exact hedge, of course, since the UVX Index may perform differently from the portfolio once UVX drops below 170. However, this put purchase will definitely remove a great deal of the market risk of further drops.

Example – Method 2: In this method, the portfolio manager is attempting to hedge the current value of his portfolio. He wants no further downside losses in his portfolio at all. He would generally buy at- or in-the-money puts in this case and would use the put's delta in order to construct a complete hedge.

Again assume that he is going to use the UVX Index puts, which are worth $100 per point. In this case, however, with the index at 178.00, he is considering the March 180 puts, trading at $4\frac{1}{2}$, with a delta of –0.60 to be used in the hedge.

In this case, the number of puts is determined by using the same formula as in the above example and then also dividing by the absolute value of the delta:

$$\text{Puts to buy} = \$720{,}000 / (100 \times 180) / 0.60$$
$$= 67$$
$$\text{Cost of protection: } 67 \times \$450 = \$30{,}150$$

In this case, the portfolio manager is spending much more for the puts, but for his additional expense, he acquires immediate protection for his portfolio. Furthermore, there is some intrinsic value to the puts he bought (2 points, or $13,400 on 67 of them). If the UVX Index drops at all, these puts will immediately begin to hedge his entire portfolio against loss. Of course, if the market rises, he loses his much more expensive insurance cost.

When one uses options instead of futures to hedge his position, he must make adjustments when the deltas of the options change. This was not the case when futures were used; perhaps with futures, one might recalculate the adjusted capitalization of the portfolio occasionally, but that would not be expected to affect the quantity of futures to any great degree. With put options, however, the changing delta can make the position delta short when the market declines, or can make it delta long if the market rises. This situation is akin to being long a straddle – the position becomes delta short as the market declines and becomes delta long as the market rises.

Basically, the adjustments would be same as those that a long straddle holder would make. If the market rallied, the position would be delta long because the delta of the puts would have shrunk and they would not be providing the portfolio with as much adjusted dollar protection as it needs. The investor might roll the puts up to a higher strike, a move that essentially locks in some of his stock profits. Alternatively, he could buy more puts at the current (low) strike to increase his protection.

Conversely, if the market had declined immediately after the position was established, the investor will find himself delta short. The delta of the long puts will have increased and there will actually be too much protection in place. His adjustment alternatives are still the same as those of a long straddle holder – he might sell some of the puts and thereby take a profit on them while still providing the required protection for the stock portfolio. Also, he might roll the puts down to a lower strike, although that is a less desirable alternative.

HEDGING WITH INDEX CALLS

Another strategy to protect a stock portfolio is to establish a ratio write using short calls against the long stock. This is the opposite of using puts for protection, in that it is more equivalent to being short a straddle.

Example: In the last example, the March 180 put had a delta of –0.60. The March 180 call should then have a delta of 0.40. If the portfolio manager wanted to hedge his portfolio by ratio writing calls against it, he could use the same formula as in the previous example:

$$\text{Calls to sell} = \$720{,}000 / (100 \times 180) / 0.40 = 100$$

He would sell 100 calls to hedge his portfolio.

Adjustments would be made in much the same manner as those that a straddle seller would make. If the market rises, the delta of the calls will increase and the position will be delta short. One would probably buy calls in that case. Follow-up action for an actual short straddle might dictate buying in some of the underlying security rather than buying the calls, but that is not a realistic alternative in this case, since the sample portfolio is probably stable.

If, on the other hand, the market declined after the short calls were sold against the portfolio, the position would become delta long as the delta of the calls shrinks. The normal action in that case would be to roll the calls down and reestablish the proper amount of protection for the portfolio.

Overall, hedging the portfolio with short index calls does not present as attractive a position as hedging with long index puts. This is due mostly to the nature of what the portfolio manager is trying to accomplish, as opposed to the relative merits of long and short straddles. As was pointed out in previous chapters, straddle selling, while risky, is an excellent strategy on a statistical basis. However, in this section we are not dealing with a strategist who is going to go out and buy stocks and then write index calls against them. Rather, we have an existing portfolio and the portfolio manager is becoming bearish on the market. Thus, the stock portfolio is a fixed entity and the index options or futures are being built around it for protection.

Long puts serve the purpose of protection far better than short calls, for the following reasons. First, the types of adjustments that need to be made by a straddle seller often involve buying stock or at least buying relatively deep in-the-money calls. A portfolio manager or investor holding a portfolio stock may not need or want to get involved in a multi-optioned position. Second, with calls there is large risk to the upside in case of a large market rally. Someone holding a portfolio of stocks might be willing to forego upside profits (as in the sale of futures), but generally would be quite upset to sustain large losses on the upside. Using puts, of course, leaves room for upside profit potential. Third, there is risk of early assignment with short index calls, although that is of minor significance in this case since the portfolio of stocks would have been long in any case. Other calls could be written immediately on the day after the assignment. The only real drawback to using the puts is that premium dollars are

paid out and, if the market stabilizes, the time value decay will cause a loss on the puts. If one actually suspects that such a stabilization might occur, he should use futures against his position instead of puts or calls.

INDEX ARBITRAGE

As previously stated, index arbitrage consists of buying virtually all of the stocks in an index and selling futures against them, or vice versa. Whenever the futures on an index are mispriced, as determined by comparing their actual value with their fair value, there may be opportunities for arbitrage if the mispricing is large enough. When futures are extremely overpriced: buy stocks, sell futures; or when futures are underpriced: sell stocks, buy futures. In either case, the arbitrageur is attempting to capture the differential between the fair value price of the futures contract and the price at which he actually buys or sells the index. First, we will examine fully hedged situations – ones in which the entire index is bought or sold. After that, we will examine smaller sets of stocks that are designed to simulate the performance of the entire index.

Hedging indices which contain fewer stocks is easier than hedging larger indices. Hedging a price-weighted index is probably the simplest type of hedge. As examples, the same sample indices that were constructed in the previous chapter will be used.

Whenever futures or index options trade on an index, it is possible to set up market baskets for arbitrage. The trader should determine, in advance, how many shares of each stock he will buy or sell in order to duplicate the index. In a price-weighted index, of course, he will buy the same number of shares of each stock. In a capitalization-weighted index, he will be buying different numbers of shares of each stock. Let us first look at how the number of shares to buy is determined. Then we will discuss some of the nuances, such as monitoring bids and offers of the indices, order execution, and others.

HOW MANY SHARES TO BUY

In advance of actually trading the stocks and futures or options, one should determine exactly how many shares of each stock he will be buying in each index he plans to arbitrage. Normally, one would decide in advance how many futures contracts or option contracts he will trade at one time. Then the number of shares of stock to be bought as a hedge can be determined as well. Essentially, one is going to hedge equal dollar amounts – that is, he will buy enough stocks to offset the total dollar amount represented by the index.

Example: Suppose that one decides he will set up his market baskets by using 50 ZYX futures at a time. How much stock should he buy against these 50 contracts? The futures contract has a trading unit of \$500 per point. Assume the ZYX Index is trading at 168.89. Then the total dollar amount represented by 50 contracts is 50 × \$500 × 168.89 = \$422,225. The hedger would buy this much stock to hedge 50 futures contracts sold.

Again note that the index price, not the futures price, is used in order to determine how many futures to sell.

In a price-weighted index, one determines the number of shares to buy by determining the total dollar value of the index he plans to trade and then dividing that dollar amount by the divisor of the index. The resulting number is how many shares of each stock to buy in order to duplicate the price-weighted index.

Example: Suppose that we have a price-weighted index composed of three stocks, A, B, and C. The following data describe the index:

Stock	Price
A	30
B	90
C	50
Price total:	170
Divisor:	1.65843
Index value:	102.51

The number of shares of each stock that is in the index is 1 divided by the divisor, or 1/1.65843 = 0.60298 shares. Thus, if we were to buy .60298 shares of each of the three stocks, we would have created the index.

Suppose that futures exist on this index and that the trading unit in these futures is \$250 per point. That is, the futures represent a total dollar value of the index times 250. With this information, it is easy to determine the number of shares of stock to buy to hedge one futures contract: 250 times the number of shares of each stock, .60298, for a total of 150.745 shares of each stock.

Normally, one would not merely sell one futures contract and hedge it with stock. Rather, he would employ larger quantities. Say that he decided to trade in lots of 100 futures contracts versus the stocks. In that case, he would buy the following number of shares of each stock:

$$\begin{aligned}\text{Number of shares} &= .60298 \times \$250/\text{point} \times 100 \text{ futures contacts} \\ &= 15074.5 \text{ shares}\end{aligned}$$

Actually he would probably buy 15,100 shares of each stock against the index, and on every fourth "round" (100 futures vs. stock) would buy 15,000 shares. This would be a very close approximation without dealing in odd lots.

The trader might also use index options as his hedge instead of futures. The striking price of the options does not come into play in this situation. Typically, one would fully hedge his position with the index options – that is, if he bought stock, he would then sell calls *and* buy puts against that stock. Both the puts and the calls would have the same strike and expiration month. This creates a riskless position. This position is a conversion.

Example: Suppose that cash-based options trade on this index, and that these options are worth $100 per point as are normal stock options – that is, an option is essentially an option on 100 shares of the index. The trader is going to synthetically short the index by buying 100 June 105 puts and selling 100 June 105 calls. Assume that the index data is the same as in the previous example, that 0.60298 shares of each stock comprise the index. How many shares would one hedge these 100 option synthetics with?

$$\begin{aligned}\text{Number of shares} &= .60298 \times 100 \text{ contracts} \times 100 \text{ shares/contract} \\ &= 6029.8 \text{ shares}\end{aligned}$$

Note that in the case of a price-weighted index, neither the current index value nor the striking price of the options involved (if options are involved) affects the number of shares of stock to buy. Both of the above examples demonstrate the fact that the number of shares to buy is strictly a function of the divisor of the price-weighted index and the unit of trading of the option or future.

Hedging a capitalization-weighted index is more complicated, although the technique revolves around determining the makeup of the index in terms of shares of stock, just as the price-weighted examples above did. Recall that we could determine the number of shares of stock in a capitalization-weighted index by dividing the float of each stock by the divisor of the index. The general formula for the number of shares of each stock to buy is:

$$\begin{array}{c}\text{Shares of stock N} \\ \text{to buy}\end{array} = \begin{array}{c}\text{Shares of N} \\ \text{in index}\end{array} \times \text{Futures quantity} \times \begin{array}{c}\text{Futures unit} \\ \text{of trading}\end{array}$$

We will use the fictional capitalization-weighted index from the previous chapter to illustrate these points.

Example: The following table identifies the pertinent facts about the fictional index, including the important data: number of shares of each stock in the index.

Stock	Price	Float	Capitalization	Shares
A	40	177,000,000	7,080,000,000	1.20
B	80	50,000,000	4,000,000,000	0.34
C	60	100,000,000	6,000,000,000	0.68
	Total capitalization:		17,080,000,000	
	Divisor: 147,500,000			
	Index value: 115.80			

Thus, if one were to buy 1.20 shares of A, .34 shares of B, and .68 shares of C, he would duplicate the index. Recall that one determines the number of shares of an individual stock in a capitalization-weighted index by dividing the float of the stock by the divisor of the index.

Suppose that a futures contract trades on this index, with one point being worth \$500 in futures profit or loss. Then one would buy an amount of each stock equal to 500 times the number of shares in the index. Further suppose that one decides to trade 5 futures at a time. Thus, the number of shares of each stock that one would have to buy to hedge the 5-lot futures position would be:

Shares to buy = Shares in index × 5 futures × \$500/future

The following table lists that information, as well as totaling the dollar amount of stock represented by the total. We will verify that the dollar amount of stock purchased is equal to the dollar amount of index represented by the futures.

Stock	Shares in Index	Shares to Buy to Hedge 5 Futures	Price	\$ Amount of Stock Bought
A	1.20	3,000	40	\$120,000
B	0.34	850	80	68,000
C	0.68	1,700	60	102,000
				\$290,000

Thus, \$290,000 worth of stock has been purchased. From an earlier example, we saw how to compute the total dollar worth of a futures trade. In this case, the index is at 115.80, 5 contracts were sold, and each point is worth \$500. Thus, the total dollar amount represented by the futures sale is 5 × 500 × 115.80 = \$289,500. This verifies that our stock purchases hedge the futures sale adequately. Note that the slight difference in the stock purchase amount and the futures sale amount is due to the fact that the number of shares in the index is carried out to only two decimal points in this example.

There is an alternative method to determine how many shares to buy. In this method, one first determines how much stock he is going to buy in total dollars. For example, he might decide that he is going to buy $10,000,000 worth of the S&P 100 (OEX) Index. Next, one determines what percentage his dollar amount is of the total capitalization of the index. For example, $10,000,000 might be something like .02% of the total capitalization of the OEX. One would then buy .02% of the total number of shares outstanding of each of the stocks in the OEX. After the number of shares of each stock to buy has been determined, one would have to determine how many futures to sell against this stock – he would divide $10,000,000 by the index price and also divide by the unit of trading for the futures. This procedure is demonstrated in the following example.

Example: Suppose that one wants to set up an arbitrage against the same index as in the previous example. For purposes of comparison with that example, we will suppose that this hedger wants to buy a total of $290,000 worth of stock. In reality, one would probably use a round number such as $300,000 or $500,000 worth of stock. However, by making a direct comparison, we will be able to more easily demonstrate that these two methods produce the same answer.

First, the hedger must determine the percent of the total capitalization that he is going to buy. In this case, he is buying $290,000 worth of stock and the total capitalization of the index is $17,080,000,000 (refer to the table at the beginning of the previous example). This means that he is buying .0016979% of the total capitalization of the index.

Next, he uses this percentage and multiplies it by the float of each stock. That is, he is going to buy .0016979% of the total number of shares outstanding of each stock in the index. This results in purchases as shown in the following table:

Stock	Float	Shares to Buy
A	177,000,000	3,005
B	50,000,000	849
C	100,000,000	1,698

Compare these share purchases with the previous example. The number of shares to buy is the same, allowing for rounding off in the previous example. Thus, these two methods of determining how many shares to buy are equivalent.

Before leaving this section, it should be pointed out that arbitrageurs can also establish an arbitrage when futures are underpriced. They can sell stocks short and buy the underpriced futures. This is a more difficult type of arbitrage to establish

because short sales must be made on plus ticks. However, when futures are underpriced for an extensive period of time – perhaps during extreme pessimism on the part of speculators – it is possible to set up the arbitrage from this viewpoint.

PROFITABILITY OF THE ARBITRAGE

The key for many arbitrageurs and institutional investors is whether, after costs, there is enough of a return in this stock versus futures strategy. The method in which we previously computed the fair value of the futures will be used in determining the overall incremental return of doing the arbitrage.

The major cost in executing the arbitrage is the cost of commissions. Since there are large quantities of stocks being bought or sold when an entire index is traded, the commission rate is generally quite low. For example, an institutional investor might pay 3 cents per share or even less. This still could be a substantial cost, especially when a large index such as the S&P 500 Index is being purchased. Even professional arbitrageurs may have to pay commission costs if they are using the services of a computer firm to buy stocks. These methods of trading stocks are described in the next section.

Once one's rate of commission charges is known, he can convert that into a number that represents a portion of the index price. He does so by multiplying his per-share commission rate by the current index value and then dividing that result by the average share price of the index. The following example describes that method of conversion.

Example: Suppose that one is going to buy the entire ZYX Index at a commission rate of 3 cents per share. The index is trading at 185.00. Furthermore, assume that the average price of a share in the index is 45 dollars per share. With this information, one can determine how much he is paying in commissions, in terms of the index itself.

$$\text{Commission in terms of index} = \frac{\text{Commission rate per share} \times \text{Index value}}{\text{Average price per share}}$$

$$= \frac{.03 \times 185.00}{45}$$

$$= .123$$

Thus, a commission rate of 3 cents per share translates into 12.3 cents of index value.

The most difficult factor to determine in the above equation is the average price per share for a capitalization-weighted index. There is a shortcut that can be used. It is easy to determine the average price per share for a price-weighted index, such as XMI. The average price per share for large-capitalization indices such as the OEX and S&P 500 is about 80% of that of the XMI.

Example: It is a simple matter to compute the average price per share for a price-weighted index. Merely divide the index value by the number of stocks comprising the index and then multiply that result by the divisor of the index. Suppose the XMI is trading at 352 and the divisor of the XMI is 4.4. Then, since there are 20 stocks in the XMI, we can quickly determine the average price per share of stocks in the XMI:

$$\text{Average price per share} = \frac{\text{Index price} \times \text{Divisor}}{\text{Number of stocks in index}}$$

$$= \frac{352 \times 4.4}{20}$$

$$= 77.44$$

Given this information, we can estimate that the average price per share for stocks in a broader-based index would be about 80% of that figure, or something like 62 or 63 dollars per share.

Now that the commission rate has been converted into an index value, one can determine his net profit from trading the exact index against the futures. One must figure in his futures commission costs as well. The following example demonstrates the net profit from executing the arbitrage, including all costs. Once the net profit has been calculated, a rate of return can be computed.

Example: Suppose that the ZYX Index is trading at 185.00 and the futures, which expire in two months, have a fair value premium of 2.00 points, but are trading at 188.50, a premium of 3.50. The futures are worth $500 per point. Thus, the futures are expensive and one might attempt to buy stocks and sell the futures. His net profit consists of the premium over fair value less all costs of entering and exiting the position.

As we saw in the previous example, at 3 cents per share stock commission, we pay an index value of .123 to enter the position. Similarly, we would pay .123 in index value to exit the position at a later date. Thus, the net round-turn stock commission is approximately 25 cents of index value.

Commissions on futures are generally charged only when the position is closed out. Generally, a futures commission on an S&P 500 contract might be reduced to something like $10 per contract for this type of hedging. Since 185.00, the index value, represents 1/500th of the value of the futures contract, we can reduce the futures commission to an index-related number by dividing the actual dollar commission by 500. Thus, the futures commission is, in index terms, 10/500, or .02. The total commission for entering and exiting the position is thus 0.266 of index value, 0.123 each for the purchase and sale of the stocks and .02 for the futures.

$$\begin{aligned}\text{Net profit} &= \begin{matrix}\text{Futures}\\ \text{price}\end{matrix} - \begin{matrix}\text{Futures fair}\\ \text{value}\end{matrix} - \begin{matrix}\text{Commission}\\ \text{costs}\end{matrix}\\ &= 188.50 - 187.00 - 0.27\\ &= 1.23\end{aligned}$$

This absolute net profit number can be converted into a rate of return by annualizing the profit and dividing by the current index price. Suppose that there are two months exactly remaining until expiration. Then the rate of return is computed as follows:

$$\begin{aligned}\begin{matrix}\text{Incremental}\\ \text{rate of return}\end{matrix} &= \frac{\text{Net profit} \times (1/\text{Time remaining})}{\text{Index price}}\\ &= \frac{1.23 \times (12/2)}{185.00}\\ &= 3.99\%\end{aligned}$$

For the two-month time period, his return is about ⅔ of one percent.

At first glance, a rate of return of almost 4% does not seem like much. But what we have computed here is an *incremental* rate of return. That is, this return is over and above whatever rate we used in determining the fair value of the futures. Thus, if an institution were going to invest its cash at the prevailing short-term rate, and that rate were used to determine the futures fair value in the above example, then the institution could earn an *additional* 4%, annualized, if it arbitraged the futures rather than put its money in the short-term money market.

TRADE EXECUTION

Most customers are not concerned with how the trades are executed, for they give the order to their broker and let him work out the details. However, for those who are interested in the actual trade execution, a short section dealing with that topic is in order.

Ideally, one should be able to monitor the progress of his index in terms of bid prices, offer prices, and last sales. There are several modern quote services that allow such monitoring. It is important to know the bids and offers because, when one actually executes the trades, he generally will be trading on the bid and offer, not the last sale.

Example: Suppose the fair value of the futures contract is represented by a premium of 1.25 points, but that the actual future is trading with a premium of 2.00 points: The index is at 165.75 and the futures are 167.75 (last sale). This might seem like enough "room" to execute a profitable arbitrage – buy the stocks in the index and sell the futures. However, the index value of 165.75 is the composite of the last sales of each of the individual stocks in the index. If one were to look at the offering prices of each stock and then recompute the index, he might end up with an index value that was 50 cents higher. This, then, would mean that he would be doing the arbitrage for 25 cents less costs, which is not enough of a margin to work with.

Similarly, when one is looking to sell out the stocks he has bought and simultaneously buy back the futures, he needs to know the bid value of the index in order to see what kind of premium he is paying to take his position off.

One normally executes the hedge by giving a series of stock orders to brokers on the floor of the exchange and simultaneously giving a futures order to the futures exchange. The actual trader controlling the order generally lets the stocks be executed at prevailing market prices, but might try to control the futures execution more closely.

There are two basic ways in which the actual stock order entry takes place. One is the conventional method of giving orders to brokers on the floor of the New York Stock Exchange. This method can be somewhat computerized by having a computer at the broker's main location send a series of orders to various locations of that brokerage firm on the floor of the exchange. The orders are then given to several brokers who quickly execute them. The speed with which the executions must take place demonstrates why the price paid is usually the offering price and not the last sale: There simply isn't enough time for the broker to try to save an eighth of a point on one stock, since he has several other orders to execute.

The other method of order entry is completely computerized. The computer knows the quantity of each stock to buy and, when prompted, sends those buy orders via telecommunications lines to one of the automatic order execution systems on the exchange floor. The most common automatic system is the POT system on the NYSE. The system attempts to guarantee the offering price for large quantities of stock. In this highly sophisticated method of order entry, the entire execution proce-

dure may take place in about one minute for the entire index. This method of order entry is so quick and accurate that some brokerage firms with this capability offer it for a commission fee to other brokerage firms that do not have the capability.

INSTITUTIONAL STRATEGIES

Holders of large portfolios of stocks can use futures and/or market basket strategies to their advantage. There are two basic strategies that can be easily used by these large traders. One is to buy futures instead of buying stocks, and the other is to sell futures instead of selling stocks. Both of these strategies will be examined in more detail.

When one of these large institutions has money to invest in buying stocks, it might make more sense to buy Treasury bills and futures instead of buying stocks. Of course, this alternative strategy only makes sense for the institution if the stock purchase were going to be broad-based – something akin to duplicating the S&P 500 performance. The institution does not necessarily have to be intent on purchasing an exact index, but if the purchase were going to be diversified, the purchase of index futures might help accomplish an equivalent result. If, however, the purchase were going to be quite specific, then this strategy would probably not apply.

This strategy works best when futures are underpriced. If the equivalent dollar amount of underpriced futures can be purchased instead of buying stocks, the entire amount intended for stock purchase can be put in Treasury bills instead. Recall that cash will have to be put into the futures account if the futures mark at a loss (maintenance margin). Even so, there can be substantial savings to the institution if the futures are truly underpriced.

The second institutional strategy is applicable when futures are overpriced and the institution wants to sell stock. In such a case, it makes more sense to sell the futures than to sell the stock. First, there are large savings in transaction costs (commissions). Second, the overpriced nature of the futures actually means that there is additional profitability in selling them as opposed to selling the stocks. Again, this strategy only makes sense if one were going to sell a diversified portfolio of stocks, something that is broad-based like the S&P 500 Index.

Of course, institutions may want to participate in the arbitrage regardless of their market stance. That is, if a money manager has a certain amount of money that he is going to put into short-term instruments (perhaps T-bills), he might instead decide to participate in this arbitrage of stocks versus futures if the incremental return is high enough. Recall that we saw how to determine the incremental return in a previous section of this chapter. If he were going to get a 7½% return from T-bills but could get an 11½% return from futures arbitrage, he might opt for the latter.

FOLLOW-UP STRATEGIES

Once any hedge has been established, it must be monitored in case an adjustment needs to be made. The first and simplest type of monitoring is to take care of spinoffs or other adjustments in stocks in the market basket that is owned. Of a more serious nature, in terms of profitability, one also needs to monitor the hedge to see if it should be removed or if the futures should be rolled forward into a more distant expiration month.

Adjusting one's portfolio for stock spinoffs is a simple matter which we will address briefly. In many cases, one of the stocks in the index will spin off a division or segment of its business and issue stock to its shareholders. Such a spinoff is generally not included in the price of the index, so that the hedger should sell off such items as soon as he receives them, for they do not pertain to his hedge.

In a similar vein, in any portfolio certain stocks may occasionally be targets of tender offers or other reorganizations. If one does nothing in such a situation, he will not lose any money in terms of his portfolio versus the underlying index. However, it is generally wise for one to tender his stock in such situations and replace it at a lower price after the tender. Sometimes, in fact, such a tender offer will entirely absorb an index component member. In that case, one must replace the disappearing stock with whatever stock is announced as the new member of the index.

Technically, in an arbitrage hedge one should adjust his portfolio every time the divisor of the index changes. Thus, in a *capitalization-weighted hedge* he would be adjusting every time one of the components issues new common stock. This is really not necessary in most cases, because the new issue is so small in comparison to the current float of the stock. Such a new issue does not include stock splits, for the divisor of the index does not change in that case. A more common case is for one of the stocks in a *price-weighted* index to split. In this case, one must adjust his portfolio. An example of such an adjustment was given in Chapter 29. In essence, one must sell off some of the split stock and buy extra shares of each of the other stocks in the price-weighted index.

Let us now take a look at follow-up methods of removing or preserving the hedge.

ROLLING TO ANOTHER MONTH

As expiration nears, the hedger is faced with a decision regarding taking off the market basket. If the futures premium is below fair value, he would probably unwind the entire position, selling the stocks and buying back the futures. However, if the futures remain expensive – especially the next series – then the hedger might roll his futures.

That is, he would buy back the ones he is short and sell the next series of futures. For S&P 500 futures, this would mean rolling out 3 months, since that index has futures that expire every 3 months. For the XMI futures and OEX index options, there are monthly expirations, so one would only have to roll out 1 month if so desired.

It is a simple matter to determine if the roll is feasible: Simply compare the fair value of the spread between the two futures in question. If the current market is greater than the theoretical value of the spread, then a roll makes sense if one is long stocks and short futures. If an arbitrageur had initially established his arbitrage when futures were underpriced, he would be short stocks and long futures. In that case he would look to roll forward to another month if the current market were less than the theoretical value of the spread.

Example: With the S&P 500 Index at 416.50, the hedger is short the March future that is trading at 417.50. The June future is trading at 421.50. Thus, there is a 4-point spread between the March and June futures contracts.

Assume that the fair value formula shows that the fair value premium for the March series is 35 cents and for the June series is 3.25. Thus, the fair value of the spread is 2.90, the difference in the fair values.

Consequently, with the current market making the spread available at 4.00, one should consider buying back his March futures and selling the June futures. The rolling forward action may be accomplished via a spread order in the futures, much like a spread order in options. This roll would leave the hedge established for another 3 months at an overpriced level.

Another way to close the position is to hold it to expiration and then sell out the stocks as the cash-based index products expire. If one were to sell his entire stock holding at the time the futures expire, he would be getting out of his hedge at exactly parity. That is, he sells his stocks at exactly the last sale of the index, and the futures expire, being marked also to the last sale of the index.

For settlement purposes of index futures and options, the S&P 500 Index and many other indices calculate the "last sale" from the *opening* prices of each stock on the last day of trading. For some other indices, the last sale uses the *closing* price of each stock.

Example: In a normal situation, if the S&P 500 index is trading at 415, say, then that represents the index based on last sales of the stocks in the index. If one were to attempt to buy all the stocks at their current offering price, however, he would probably be paying approximately another 50 cents, or 415.50, for his market basket. Similarly, if he were to sell all the stocks at the current bid price, then he would sell the market basket at the equivalent of approximately 414.50.

However, on the last day of trading, the cash-based index product will expire at the opening price of the index. If one were to sell out his entire market basket of stocks at the current bid prices at the exact opening of trading on that day, he would sell his market basket at the calculated last sale of the index. That is, he would actually be creating the last sale price of the index himself, and would thereby be removing his position at parity.

The problem with this is that it is correct theory, but difficult to put into practice. For example, if one has several million dollars of stocks to sell, he cannot expect the marketplace to absorb them easily when they are all being sold at the last minute on a Friday afternoon. We will discuss this more fully momentarily, when we look at the impact of stock index arbitrage on the stock market in general.

There is another interesting facet of the arbitrage strategy that combines the spread between the near-term future and the next longest one with the idea of executing the stock portion of the arbitrage at the close of trading on the day the index products expire. Use of this strategy actually allows one to enter and exit the hedge without having to lose the spread between last sale and bid or last sale and offer in either case. Suppose that one feels that he would set up the arbitrage for 3 months if he could establish it at a net price of 1.50 over fair value. Furthermore, if the fair value of the 3-month spread is 2.10, but it is currently trading at 3.60, then that represents 1.50 over fair value. One initiates the position by buying the near-term future and selling the longer-term future for a net credit of 3.60 points. At expiration of the near-term future, rather than close out the spread, one *buys* the stocks that comprise the index at the last sale of the trading day, thereby establishing his long stock position at the last sale price of the index at the same moment that his long futures expire. The resultant position is long stocks and short futures that expire in 3 months at a premium of 3.60. Since the fair value of such a 3-month future should be 2.10, the hedge is established at 1.50 over fair value. The position can be removed at expiration in the same manner as described in the previous paragraph, again saving the differential between last sale and the bids of the stocks in the index. Note that this strategy creates buying pressure on the stock market at expiration of the near-term side of the spread, and selling pressure at the latter expiration.

The final way to exit from one's position is to remove it before expiration. Sometimes, there are opportunities during the last two or three weeks before the futures expire. If one hedged with long stock and short futures, the opportunities to remove the hedge arise when the futures trade below fair value – perhaps even at an actual discount to parity. If the futures never trade below fair value, but instead continue to remain expensive, then rolling to the next expiration series is often warranted.

MARKET BASKET RISK

There are some uncertainties in this type of hedging, even though the entire index is being bought. Since one owns the actual index, there is no risk that the stocks one owns will fail to hedge the futures price movements properly. However, there are other risks. One is the risk of execution. That is, it may appear that the futures are trading at a premium of 1.50 points when one enters the orders. However, if other hedgers are doing the same thing at the same time, one may pay more for the stocks than he thought when he entered his order, and he may sell the futures for less as well. This "execution risk" is generally small, but if one is too slow in getting his stock orders executed, he may have set up a hedge that was not as attractive as he first thought.

One major risk is that interest rates might move against the arbitrageur while the position is in place. If he is long stocks and short the futures, then he would not want interest rates to rise. In the previous example, the incremental return for the 2-month time period that the position was going to be held was $2/3$ of one percent. If short-term rates should rise by more than that, on average, for the 2-month period, the incremental strategy would be inferior. His carrying costs would have increased to the point of wiping out the profit from his arbitrage.

For institutional arbitrageurs who don't exactly have cost of carry, this situation would be viewed in the following manner: If rates increase, he may find that he would have been better off having his money invested in a money market fund at the prevailing short-term rate than in the incremental arbitrage strategy. Conversely, if the arbitrage was originally established with short stocks and long futures, the arbitrageur would not want rates to *drop* for similar reasons.

One might leave a cushion against a movement in rates. If rates are currently 8%, then one might decide to use a 10% rate as a cushion. Hedges established that are profitable at the higher rate level will consequently be able to withstand rates moving up to 10%.

Example: Suppose that one would normally use a rate of $7\frac{1}{2}$% and would establish the long stock versus short futures hedge at an incremental rate of return of $1\frac{1}{2}$%. This is a relatively narrow cushion and if the hedge is on for a moderate length of time, rates could move up to such an extent that they advance to $9\frac{1}{2}$% or higher. Such a move would make the hedge position unprofitable. Instead, one might calculate the fair value of the futures using a rate equal to his current prevailing rate plus a cushion. That is, if his current rate is $7\frac{1}{2}$%, he might use $8\frac{1}{2}$% and still demand an incremental return of $1\frac{1}{2}$%. If he established the hedge at these levels, he could suffer a move of 1%, the cushion, against him and still earn his incremental rate of $1\frac{1}{2}$%.

Another risk that the arbitrageur faces is that of changes in the dividend payout of the stocks in the index. Suppose that he is long stocks and short futures. If there are enough cuts in dividend payout, or dividend payments are delayed past the expiration date of the futures, then he will lose some of his return. Arbitrageurs who are short stocks and long futures would have similar problems if dividend payout were increased – especially if a large special dividend were declared by a company that is a major component of the index – or payment dates were accelerated.

If one holds the arbitrage until expiration, he will be able to unwind it at parity. However, if he decides to remove the arbitrage before expiration, he might incur increased costs that would harm his projected return. Instead of selling his stocks at the last sale of the index, as he is able to do on expiration day, he would have to sell them on their bids, a fact that could cost him a significant portion of his profit.

In a later section, where we discuss hedging the futures with a market basket of stocks that does not exactly represent the entire index, we will be concerned with the greatest risk of all, "tracking error" – the difference between the performance of the index and the performance of the market basket of stocks being purchased.

IMPACT ON THE STOCK MARKET

The act of establishing and removing these hedge positions affects the stock market on a short-term basis. It is affected both before expiration and also at expiration of the index products. We will examine both cases and will also address how the strategist can attempt to benefit from his knowledge of this situation.

IMPACT BEFORE EXPIRATION

When bullish speculators drive the price of futures too high, arbitrageurs will attempt to move in to establish positions by buying stock and selling futures. This action will cause the stock market to jump higher, especially since positions are normally established with great speed and stocks are bought at offering prices. Such acceleration on the upside can move the market up by a great deal in terms of the Dow-Jones Industrials in a matter of minutes.

Conversely, if futures become cheap there is also the possibility that arbitrageurs can drive the market downward. If positions are already established from the long side (long stock, short futures), then arbitrageurs might decide to unwind their positions if futures become too cheap. They would do this if futures were so cheap that it becomes more profitable to remove the position, even though stocks must be sold on their bid, rather than hold it to expiration or roll it to another series.

When these long hedges are unwound in this manner, the stock market will decline quickly as stocks are sold on bids. In this case, the market can fall a substantial amount in just a few minutes.

Once long hedges are unwound, however, cheap futures will not cause the market to decline. If there is no more stock held long in hedges, then the only strategy that arbitrageurs can employ when futures become cheap is to sell stock short and buy futures. Since stock must be sold short on upticks, this action may put a "lid" on the market, but will not cause it to decline quickly.

Having long stock and short futures when these large discounts occur is so valuable to an arbitrageur that some traders will establish the long stock/short futures hedge for no profit or even a loss. They hope that subsequently futures will plunge to a large discount and they can unwind their positions for large profits. If that never occurs, they only lose a few cents of index value. Assume futures fair value is 3.50 over. Such arbitrageurs might buy stock and sell futures at a net cost of 3.45 over. That is, if they hold the position until expiration they will lose 5 cents, but if a large futures discount ever occurs, they will profit.

Regulatory bodies have become increasingly concerned over the years as to the effect that program trading and index arbitrage have on the stock market. In reality, when stocks and futures are executed more or less simultaneously, these strategies should not overly disturb the stock market. However, since they are not executed simultaneously (there are no rules in the futures markets against frontrunning), the New York Stock Exchange has imposed an arbitrary limit, called a "circuit breaker," on these activities. If the Dow-Jones averages rise or fall more than a specified distance (for example, 200 points) at any time during a trading day, all computer-driven program order entry is prohibited for the rest of the day, or until the Dow-Jones moves back to within 25 points of being unchanged on the day. This trading ban effectively shuts down program trading and index arbitrage, although it is still allowable to do it by having the trades executed by individual floor brokers. Some of the larger trading houses, trading for their own accounts, are therefore still able to execute index arbitrage if the discount in the futures is extremely wide, even when the trading ban is in effect.

The trading ban is really meant to halt declining markets, although in the interest of fairness, the ban goes into effect on days when the Dow-Jones rises by the specified distance (for example, 200 points) as well. Of the various measures that have been tried in order to stop a declining market from becoming a crash (e.g., circuit breaker trading limits on S&P 500 futures), this seems to be the most effective. There have been many times when the Dow-Jones has accelerated to the limit, and then once the trading ban went into effect, the Dow-Jones would slide slowly back the other way, but at a much more leisurely pace.

Readers should remember, of course, that the stock market can move independently of the overpriced or underpriced nature of index products. That is, if futures are overpriced, the stock market can still decline. Perhaps there is a preponderance of natural sellers of stocks. Similarly, if futures are cheap, the stock market can still go up if enough traders are bullish. Thus, one should be cautious about trying to link every movement of the stock market to index products.

PORTFOLIO INSURANCE

Portfolio insurance is the generic name used to describe a strategy in which a portfolio manager uses the index derivatives market to protect his portfolio in case the market crashes. He could either sell futures or buy puts.

The generic concept was put into effect using futures in the mid 1980s. In the form of the strategy that was being practiced at the time, the portfolio manager did not sell futures against his entire portfolio right away. Rather, he sold only a few to begin with. This allowed him to retain a good deal of upside profit potential for his portfolio. If the market dropped further, then he would sell more. Eventually, if it dropped far enough, he would keep selling futures until his entire portfolio was properly hedged. There were computer programs that calculated when to sell the futures and how many to sell in order for the portfolio manager to eventually end up with the proper amount of insurance at the right price.

Unfortunately, the concept did not work properly in practice. In fact, it has often been identified as one of the major factors in the 500-point crash of October 19, 1987. What happened during the days leading up to that date was that the market was already going down fast. Futures, as a result, began to trade at a discount. The portfolio insurance strategy assumes futures are sold at fair value, more or less. Thus, the portfolio insurance managers did not sell their futures when they had originally intended; or they could not sell enough without driving the futures to tremendous discounts. In any case, the market kept going further down without any rebound (essentially from about mid-afternoon on Thursday, October 15, through the close on Monday, October 19), a total of over 650 points on the Dow-Jones averages.* As the market plunged, the portfolio insurance strategy kept demanding that more futures be sold, and they were, but often at prices well below where the strategy had originally dictated. This continued selling kept futures at a discount, which triggered even more selling by other program traders and index arbitrageurs.

As a result, the portfolios were not completely protected – although it should be noted that they were somewhat protected since they had been selling some futures. Hence, the portfolio managers were not pleased. Stock market regulators were not pleased, either, although nothing illegal had been done. The strategy lost most of its adherents at that time and has not been resurrected in its previous form.

*This represented a decline of over 25% from the relatively low levels (mid-2000s) that the index was trading at during that time frame.

However, the concept is still a valid one, and it is now generally being practiced with the purchase of put options. The futures strategy was, in theory, superior to buying puts because the portfolio manager was supposed to be able to collect the premium from selling the futures. However, its breakdown came during the crash in that it was impossible to buy the insurance when it was most needed – similar to attempting to buy fire insurance while your house is burning down.

Currently, the portfolio manager buys puts to protect his portfolio. Many of these puts are bought directly over-the-counter from major banks or brokerage houses, for they can be tailored directly to the portfolio manager's liking. This practice concerns regulators somewhat, because the major banks and brokerage houses that are selling the puts are taking some risk, of course. They hedge the sales (with futures or other puts), but regulators are concerned that, if another crash occurred, it would be the writers of these puts who would be in the market selling futures in a mad frenzy to protect their short put positions. Hopefully, the put sellers will be able to hedge their positions properly without disturbing the stock market to any great degree.

IMPACT AT EXPIRATION – THE RUSH TO EXIT

Some traders persist in attempting to get out of their positions on the last day, at the last minute. These traders are not normally professional arbitrageurs, but institutional clients who are large enough to practice market basket hedging. Moreover, they have positions in indices whose options expire at the close of trading (OEX, for example). If these hedgers have stock to sell, what generally happens is that some traders begin to sell before the close, figuring they will get better prices by beating the crowd to the exit. Thus, about an hour before the close, the market may begin to drift down and then accelerate as the closing bell draws nearer. Finally, right on the bell that announces the end of trading for the day, whatever stock has not yet been sold will be sold on blocks – normally significantly lower than the previous last sale. These depressed sales will make the index decline in price dramatically at the last minute, when there is no longer an opportunity to trade against it.

These blocks are often purchased by large trading houses that advance their own capital to take the hedgers out of their positions. The hedgers are generally customers of the block trading houses. Normally, on Monday, the market will rebound somewhat and these blocks of stock can be sold back into the market at a profit.

Whatever happens on Monday, though, is of little solace to the trader trapped in the aftermath of the Friday action. For example, if one happened to be short puts and the index was near the strike as the close of trading was drawing near on Friday afternoon, he might decide to do nothing and merely allow the puts to expire, figuring that he would buy them back for a small cost when he was assigned at expiration.

However, this flurry of block prints on the close might drive the index down by 2 or 3 points! This is an extremely large move for the index, and the option trader has no recourse as the options cease trading. An index composed of only a few stocks, such as the Dow-Jones 30 Industrials, will fall most dramatically when these events occur, although the OEX will drop heavily as well.

We have also previously seen that the late market action on expiration day might be bullish. If institutional arbitrageurs have established the futures spread by being long the short-term futures and short the next series, then they will be buyers of stocks at the close of trading on expiration day. Additionally, if the only remaining arbitrage positions at expiration are short stocks versus long futures, then there might also be buying pressure at expiration.

As might be expected, these events have not gone unnoticed and have caused some consternation among both regulators and traders. There have been accusations that some traders – particularly those with foreknowledge of the block prints to come – buy very cheap index options on the last afternoon of trading and then force those options to become profitable by selling their clients' portfolios in the manner described above.

The strategist cannot be concerned with whether someone is acting irrationally or worse. Rather, he must decide how he will handle the situation should it occur. The key is to try to determine the direction that the market will move at the close of expiration day, if that is discernible. If futures have had a large premium for a long period of time, then one must assume that many hedgers have long stock versus short futures. Furthermore, even if futures subsequently trade below fair value, there will still be some hedgers who have stubbornly kept their positions, waiting to roll. The strategist should recognize that fact and take appropriate action late on the last day of trading: Don't establish bullish positions at that time and don't allow positions that are expiring that day to become too bullish. That is, if one is short puts and the index is trading near the striking price of the puts, then buy them back.

Thus, *the strategist must be aware of how the futures have traded during the last 3 months in order to determine how he will address his positions on the last day.* Even with this information, there is no guarantee that one can exactly predict what will happen at expiration unless one is privy to the actual stock buy and sell orders. This order flow information is closely guarded and known only to the firms that will be executing the orders, generally on behalf of institutions. Consequently, it is a very risky strategy to attempt to apply this information for establishing positions on expiration day itself. That is, if one expects stock buy orders at expiration, he might decide to buy some cheap, expiring calls for himself on the last afternoon of trading. Conversely, if he expects stock selling, he might buy puts. Given the fact that such movements are hard to predict, such aggressive strategies are not warranted.

SIMULATING AN INDEX

The discussion in the previous section assumed that one bought enough stocks to duplicate the entire index. This is unfeasible for many investors for a variety of reasons, the most prominent being that the execution capability and capital required prevent one from being able to duplicate the indices. Still, these traders obviously would like to take advantage of theoretical pricing discrepancies in the futures contracts. The way to do this, in a hedged manner, would be to set up a market basket of a small number of stocks, in order to have some sort of hedge against the futures position.

In this section, we will demonstrate approaches that can be taken to hedge the futures position with a small number of stocks. This is different from when we looked at how to hedge individualized portfolios with index futures or options, because we are now going to try to duplicate the performance of the entire index, but do it with a subset of stocks in the index. In either of these cases, a mathematical technique called regression analysis can be used to measure the performance of these portfolios or small market baskets. However, we will take a simpler approach that does not require such sophisticated calculations, but will produce the desired results.

USING THE HIGH-CAPITALIZATION STOCKS

Recall that in a capitalization-weighted index, the stocks with the largest capitalizations (price times float) have the most weight. In many such indices, there are a handful of stocks that carry much more weight than the other stocks. Therefore, it is often possible to try to create a market basket of just those stocks as a hedge against a futures position. While this type of basket will certainly not track the index exactly, it will have a definite positive correlation to the index.

What one essentially tries to accomplish with the smaller market basket is to hedge dollars represented by the index with the same dollar amount of stocks. No hedge works in which the total dollars involved are not nearly equal. Listed below are the steps necessary to compute how many shares of each stock to buy in order to create a "mini-index" to hedge futures or options on a larger index:

1. Determine the percent of the large index to be hedged (OEX, NYSE, S&P 500, etc.) that each stock comprises. This information is readily available from the exchange on which the futures or options trade or can be calculated by the methods shown in Chapter 29.
2. Determine the percent of the mini-index to be constructed that each stock comprises, by inflating their relative percentages to total 100%.

3. Decide the total dollar amount of the index to be traded at one time: index value times futures or option quantity times unit of trading in the futures.
4. Multiply the total dollar amount from step 3 by each individual percentage from step 2 to determine how many dollars of each stock to buy.
5. Divide the result from step 4 by the price of the stock in order to determine how many shares to buy.

These steps will result in the construction of a mini-index consisting of a small number of stocks that are grouped together in relative proportion to their weights in the larger index, and have a total dollar amount sufficient to trade against the desired futures or options trading lot. This approach ignores volatility. Even without accounting for volatility, this approach is reasonable when using high-capitalization stocks to hedge a broad-based index.

Among the largest-capitalization stocks are International Business Machines (IBM), Exxon (XON), General Electric (GE), and General Motors (GM). As a result, these four form the foundation of many small market baskets. All four are in the OEX (S&P 100), the S&P 500, and other major capitalization-weighted indices. As a first example, let us examine how one would hedge the futures using these four stocks only, according to the five steps outlined above.

Example: Suppose we are attempting to create a hedge for a fictional index, the UVX, by using IBM, XON, GM, and GE. The following table gives certain information that will be necessary in computing how many shares of each stock to use in the small basket.

Stock	Float	Price	Shares in Index	Capitalization	Pct of Index (Step 1)
IBM	600,000	130	0.171	78,000,000	13.1%
XON	850,000	40	0.243	34,000,000	5.7%
CE	450,000	70	0.129	31,500,000	5.3%
GM	300,000	85	0.086	25,500,000	4.3%
					28.4%

UVX price: 170.25
Divisor: 3,500,000
Total capitalization: 595,875,000 (price times divisor)

Recall how these items are calculated: The number of shares of a stock in the index is that stock's float divided by the divisor of the index. Also, the percent of the index is the stock's capitalization (float times price) divided by the total capitalization of the index (this is step 1 above). Finally, the index value is the index's total capitalization divided by the index divisor.

With this information, we can now construct a mini-index that could be used to hedge the UVX itself. Notice that these four stocks alone comprise 28.4% of the entire UVX index. We would want each of these four stocks to have the same relative weight within our mini-index as they do within the UVX itself. The sum of the capitalizations of the four stocks in the above table as well as their relative percentages are given in the following table.

Stock	Capitalization	Pct of Index (Step 1)	Pct of Mini-Index (Step 2)
IBM	78,000,000	13.1%	46.2%
XON	34,000,000	5.7%	20.1%
GE	31,500,000	5.3%	18.6%
GM	25,500,000	4.3%	15.1%
Total:	169,000,000	28.4%	100.0%

The percent of the mini-index is each of the four stocks' capitalizations as a percent of the sum of their capitalizations (step 2 from above). There are two ways to compute step 2. First, for IBM one would divide 78 million (its capitalization) by 169 million (the total capitalization). Second, using the percentages from step 1, divide IBM's percent, 13.1, by 28.4, the total percent. Either method gives the answer of 46.2 percent. We have now constructed the relative percentages of the mini-index that each stock comprises. Note that they are in the same relationship to each other as they are in the UVX itself. Now it is a simple matter to convert that percent into shares of stock, once we decide how many futures contracts to trade against our mini-index.

When we know the total dollar amount of futures to hedge and we know the percent of the mini-index that each stock comprises, we can compute each stock's capitalization within the mini-index. Finally, we divide by that stock's price to see how many shares of each stock to buy. Assume that we are going to use UVX options, which are worth $100 per point, in lots of 50 options. The total dollar amount of the index with the UVX at 170.25 would then be $851,250 (170.25 × 100 × 50). This accomplishes step 3. The following table shows the calculations necessary to determine how many shares of stock to buy against these 50 option contracts.

Stock	Pct of Mini-Index	Capitalization in Mini-Index (Step 4)	Price	Shares to Buy (Step 5)
IBM	46.2%	393,277	130	3,025
XON	20.1%	171,102	40	4,277
GE	18.6%	158,332	70	2,261
GM	15.1%	128,539	85	1,512
Total:	100.0%	851,250		

Note that the capitalization of each stock in the mini-index is determined by multiplying the desired trading lot ($851,250) by the percent of the mini-index that that stock comprises. This completes step 4, and step 5 follows: The number of shares of each stock to buy is then determined by dividing that number by the price of the stock. For example, the calculation for IBM in the above table would be $851,250 × .462 = $393,277; then $393,277/130 = 3,025.

Thus, one could attempt to hedge 50 UVX option contracts with the above amounts of each of the four stocks. As a matter of practicality, one would not buy the odd lots, but would probably round off each stock quantity to round lots: 3,000 IBM, 4,300 XON, 2,300 GE, and 1,500 GM.

As the prices of the stocks in the mini-basket change, the mini-basket needs to be recalculated. This is because the current prices of the stocks in the index were used to compute the mini-index. Thus, as the prices of the stocks change, the composition of our mini-index will begin to deviate from the composition of the UVX.

Example: Suppose that oil stocks do poorly and XON falls to 35 (it was 40 when we constructed the mini-index), while the other stocks are the same price as in the previous example. Finally, suppose that the overall UVX is unchanged at 170.25, even though Exxon has changed substantially. We must recalculate step 1: Determine the percent that each stock is of the UVX. Assume the divisor is unchanged and each stock's float is unchanged, so the percent is the price times the float divided by the total capitalization (595,875,000).

Stock	Price	Float (000s)	Capitalization (Millions)	Percent of Index (Step 1)	Percent of Mini-Index (Step 2)
IBM	130	600	78.00	13.1%	47.3%
XON	35	850	29.75	5.0%	18.1%
GE	70	450	31.50	5.3%	19.1%
GM	85	300	25.50	4.3%	15.5%
Total:			164.75	27.7%	100.0%

Note that the percent that Exxon comprises of the UVX as well as of the mini-index has fallen. All three of the other stock's percentages have increased proportionately. These percentage changes reflect the changes in the stock prices. Since we assumed the UVX is unchanged, the capitalization of the desired mini-index is still $851,250 (170.25 × $100 per point x 50 options). Now, if we complete steps 4 and 5, we will see how many shares of each stock make up the new version of the mini-index.

Stock	Capitalization in Mini-Index (Step 4)	Price	Shares to Buy (Step 5)
IBM	$402,641	130	3,097
XON	154,076	35	4,402
GE	162,589	70	2,323
GM	131,944	85	1,552
Total:	$851,250		

Compare the number of shares to be bought in this example with the number of shares to be bought in the previous example. Actually, we are buying more shares of each of the stocks. There are two reasons for this. In Exxon's case, we are buying more shares since the price has dropped more as a percentage of its previous price than its capitalization has dropped as a percentage. For the other stocks, we are buying more shares because the capitalization of each has increased within the mini-index and the price is unchanged.

This example serves to show that as the prices of the stocks in the mini-index change, the number of shares of each of the stocks might change. This means that the hedger using this type of hedge should recalculate the makeup of the index rather frequently – at least once a week. In actual practice, the hedger will know which stocks are underperforming and which are outperforming. Hence, he will have some idea of what needs to be done in advance of actually computing it.

There are many methods of approaching these "mini-indices." Some traders who are extremely short-term oriented – possibly moving in and out of the futures one or more times daily – might attempt to hedge the futures with only *one* stock (generally the largest-capitalization stock, such as IBM, unless there is some reason to believe that the general market is moving in a substantially different direction from the largest of all stocks).

In other cases, hedgers with more capital and more resources but who are unwilling to hedge the entire index might try to use a larger mini-index to hedge with.

In cases such as these, one is generally not interested in day-trading the futures and stocks, but rather in attempting to simulate the full hedge against fair value, as described earlier. For example, the top 30 capitalization stocks in the OEX make up over 70% of the capitalization of the index. This provides very accurate tracking, but still does not overly tax the execution capabilities of even a small trading desk. Such a 30-stock mini-index can be calculated in exactly the same manner as in the previous examples. Since it represents over 70% of the index, it will track the index quite well, although not perfectly of course.

However, if one tried to simulate the S&P 500 Index by buying the top 50 stocks, he would still not own even 40% of the capitalization of the index. This does not provide as accurate tracking as one would hope after having bought 50 stocks. As a result, if one were trying to hedge the S&P 500 Index, he should use at least 200 stocks.

TRACKING ERROR RISK

In any such simulated index portfolio, there is the largest risk of all with regard to index hedging, the *tracking error*. Tracking error is the difference in performance between the actual index and the simulated index portfolio. There are statistical ways to predict how closely a certain portfolio of stocks will simulate a given index. This is something akin to pollsters predicting the margin of victory of an election before the election is held. One may hear that a certain portfolio has a 98% correlation, say, to an index it is intended to simulate.

What does this measure represent? First, it must be understood that statistics cannot predict the exact performance of any set of stocks with respect to any other set, just as polls cannot exactly predict the outcome of an election. What the statistics do tell us is how probable it is that a certain portfolio will perform nearly the same as another one. The concept of expected return, which was described earlier in this book, is something like this. The statistical number does not guarantee that the portfolio will perform like the index 98% of the time or that it will never deviate from the index by more than 2%. It is merely a comparative measure that says that such a portfolio has a good correlation to the index.

The actual risk that one is taking by using the simulated index instead of the index itself is not completely measurable. If it were, then we could predict the exact performance of the simulated index, which we just showed we could not. However, assume an average performance – that the simulated index deviates from the real index by 2% over the course of 1 year. If we are speaking of the S&P 500 at 415, then 2% would be 9.30 points over a 1-year period, or 2.33 points over a 3-month period.

That is a substantial amount of movement when one considers that most of our arbitrage examples were assuming profits of not much more than that. The compensating factor to this risk is that the simulated index may outperform the actual index and one could make more profits than would be available with arbitrage. If one had enough capital and enough time to constantly be participating in such a simulated-index strategy, he would, over time, have a tracking error that is relatively small if his simulated index has a high correlation to the index.

MONITORING THE HEDGE

Once the position has been established, the trader should have some way of monitoring the position. Ideally, he would have a computer system that could compute his mini-index in real time. This would allow accurate comparisons between the actual index movement and the mini-index. Tracking error can, of course, work for or against the trader.

It is not necessary to have a computer system built specifically for index hedging. Many computerized systems provide for real-time profit and loss calculations on a portfolio of the user's choosing. Any of these systems would be sufficient for computation of the relative value of the mini-index. In the course of computing the profit or loss on the portfolio, the program must compute the net value of the portfolio. As long as this is available, one can convert it into a mini-index value, suitable for comparison to the larger index. The "trick" is to use a mini-index multiplier that is a power of 10. That is, the futures unit of trading times the futures quantity is a power of 10. For example, if the futures unit of trading is $250 as with the S&P 500 futures, then a quantity of 40 would result in a power of 10 ($250 × 40 = 10,000). This means that the total capitalization of the mini-index portfolio should be able to be read as the "index value" with the mere adjustment of a decimal point.

Example: If one is trading against futures that have a trading move of $500 per point, then he might choose to use 20 futures against his mini-index. That is, the multiplier is 20 × $500 or $10,000. If he were hedging against an index trading at 170.25, he would then buy 10,000 × 170.25 or $1,702,500 worth of stock. The total value of the stocks in his mini-index would total $1,702,500 initially and he could therefore determine his mini-index value to be 170.2500 by moving the decimal point over four places. The following table summarizes how this might be constructed using the four stocks in the most recent example. Recall that in the previous example, the total capitalization of the four-stock mini-index was $851,250. In this example we would have had a total mini-index capitalization of twice that, or $1,702,500. Thus, the capitalization and the number of shares to buy are doubled from the previous example.

Stock	Capitalization in Mini-Index (Step 4)	Price	Shares to Buy
IBM	$ 805,282	130	6,194
XON	308,152	35	8,804
GE	325,178	70	4,646
GM	263,888	85	3,104
Total:	$1,702,500		

Later, as the stocks change in value, one's computerized profit and loss system could readily compute the total capitalization of the mini-index and, by moving the decimal point over four places, have a "mini-index value" that could be compared against the actual index (UVX in this case) in order to determine tracking error.

Example: Suppose that the stocks in the mini-index were to increase to have a total value of $1,761,872 as shown in the following table.

Stock	Shares Owned	Price	Current Capitalization
IBM	6,194	135	$ 836,190
XON	8,804	37	325,748
GE	4,646	69	320,574
GM	3,104	90	279,360
Total:			$1,761,872

The mini-index value is now 176.1872 (moving the decimal point over four places), or 176.19. This means that our mini-index increased from a value of 170.25 to 176.19, an increase of 5.94. This could be compared to the UVX movement during the same period of time. For example, if the UVX had increased by 6.50 points over the time period, then it is easy to see that the mini-index underperformed the UVX by 56 cents. If, at some other time, our mini-index had increased faster than the UVX, then we would have tracking error in our favor.

USING OPTIONS INSTEAD OF FUTURES

As pointed out earlier, one could use options instead of futures when hedging these indices. Assuming one is creating a fully hedged situation, he would have positions similar to conversions when he uses options to hedge a long stock market basket posi-

tion. He would both sell calls and buy puts with the same striking price in order to create the hedge. This is similar to a conversion arbitrage.

When attempting to hedge the S&P 500, one could use the S&P 500 futures options or the S&P 500 cash options, but that would not necessarily present a more attractive situation than using the futures. On the other hand, there is not a liquid S&P 100 (OEX) futures contract, so that when hedging that contract, one generally uses the OEX options. As mentioned earlier, inter-index option spreads between various indices, including the S&P 100 and 500, will be discussed in the next chapter.

There is not normally much difference as to which of the two is better at any one time. However, since a full option hedge requires two executions (both selling the call and buying the put), the futures probably have a slight advantage in that they involve only a single execution.

In order to substitute options for futures in any of the examples in these chapters on indices, one merely has to use the appropriate number of options as compared to the futures. If one were going to sell OEX calls instead of S&P 500 futures, he would multiply the futures quantity by 5. Five is the multiple because S&P 500 futures are worth $250 per point while OEX options are worth $100 per point, and because the S&P 500 Index (SPX) trades at twice the price of OEX (OEX split 2-for-1 in November 1997). Thus, if an example calls for the sale of 20 S&P 500 futures, then an equivalent hedge with OEX options would require 100 short calls and 100 long puts.

One could attempt to create less fully hedged positions by using the options instead of the futures. For example, he might buy stocks and just write in-the-money calls instead of selling futures. This would create a covered call write. He would still use the same techniques to decide how much of each stock to buy, but he would have downside risk if he decided not to buy the puts. Such a position would be most attractive when the calls are very overpriced.

Similarly, one might try to buy the stocks and buy slightly in-the-money puts without selling the calls. This position is a synthetic long call; it would have upside profit potential and would lose if the index fell, but would have limited risk. Such a position might be established when puts are cheap and calls are expensive.

TRADING THE TRACKING ERROR

Another reason that one might sell futures against a portfolio of stocks is to actually attempt to capture the tracking error. If one were bullish on oil drilling stocks, for example, and expected them to outperform the general market, he might buy sever-

al drillers and sell S&P 500 futures against them. The sale of the futures essentially removes "the market" from the package of drilling stocks. What would be left is a position that will reflect how well the drillers perform against the general stock market. If they outperform, the investor will make money. In this section, we are going to look at ways of implementing these hedging strategies. This investor is not particularly concerned with predicting whether the market will go up or down; all he wants to do is remove the "market" from his set of stocks. Then he hopes to profit if these stocks do, indeed, outperform the broad market. Again, we will not use regression analysis, but instead will concentrate on methods that are more simply implemented.

Often, investors or portfolio managers think in terms of industry groups. That is, one may think that the oil drilling stocks will outperform the market, or that the auto stocks will underperform, for example. In either case, one sells futures to attempt to remove the market action and capitalize on the performance differential. In some sense, *one is creating a hedge in which he hopes to profit from tracking error.* In previous discussions, tracking error has not been considered a particularly desirable thing. In this situation, however, one is going to attempt to profit by predicting the direction of the tracking error and trading it.

The technique for establishing this hedge is exactly the same as in the examples at the beginning of this chapter, when we looked at hedging a specific stock portfolio. The exception is that now one must decide which stocks to buy. Once that is decided, he can use the four steps outlined previously to decide how many futures to sell against them:

Step 1: Compute each stock's adjusted volatility by dividing its volatility by that of the market. Use Beta if the group's movement does not correlate well with the general market.

Step 2: Multiply by the quantity and price of each stock to get an adjusted capitalization.

Step 3: Add these to get the total capitalization for the portfolio.

Step 4: Determine how many futures to sell by dividing the index price into the total adjusted capitalization.

Example: Suppose that an investor feels that oil drilling stocks will outperform the market. He decides to invest $500,000 to buy equal dollar amounts of five drilling stocks. Normally one would buy an equal dollar amount of each stock in this situation. The stocks are Hughes Tool (HT), Fluor Corp (FLR), Schlumberger (SLB), Kaneb (KAB), and Halliburton (HAL). The first table shows the price of each stock and how many shares of each will be purchased; $100,000 is invested in each stock.

Stock	Price	Quantity Purchased
FLR	20	5,000
HAL	50	2,000
HT	25	4,000
KAB	10	10,000
SLB	40	2,500

Now, if one obtains the volatilities of these stocks, he can perform the necessary computations. These computations will tell him how many futures to sell against the portfolio of drilling stocks. The volatilities and computations are given in the following table, assuming the market volatility is 15%. First, dividing the stock's volatility by the market's volatility gives the adjusted volatility (step 1). That result multiplied by the price and quantity of the stock gives the adjusted capitalization (step 2), and adding these together gives the total adjusted capitalization (step 3).

Stock	Volatility	Adjusted Volatility (Step 1)	Price	Quantity Owned	Adjusted Capitalization (Step 2)
FLR	.46	3.07	20	5,000	$ 306,667
HAL	.30	2.00	50	2,000	200,000
HT	.21	1.67	25	4,000	166,667
KAB	.50	3.33	10	10,000	333,333
SLE	.35	2.33	40	5,000	233,333
Total adjusted capitalization:					$1,240,000 (step 3)

Assume that one wants to hedge with a fictional index, ZYX, and that ZYX futures are worth $500 per point. If the ZYX Index is selling at 175, then one would sell 14 futures against this portfolio of drilling stocks: $1,240,000 ÷ $500 per point ÷ 175 is approximately equal to 14 (step 4).

In a situation such as this, one does not have to be bullish or bearish on the market in order to establish the hedge. He is rather attempting to time the performance of the group in question. Similarly, the decision as to when to remove the position is not a matter of market opinion. Perhaps one has an unrealized profit and decides to take it, or perhaps something changes fundamentally within the group

that leads the investor to believe that the group no longer has the potential to outperform the market.

If the futures are underpriced when one begins to investigate this strategy, he should not establish the position. What is gained in tracking error could be lost in theoretical value of the futures. Since one is establishing both sides of the hedge (stocks and futures) at essentially the same time, he can afford to wait until the futures are attractively priced. This is not to say that the futures must be overpriced when the position is established, although that fact would be an enhancement to the position.

If one thinks that a particular group will underperform the market, he merely needs to decide how many shares of each stock to sell short and then can determine how many futures to buy against the short sales in order to try to capture the tracking error. If one decides to capture the negative tracking error in this manner, he must be careful not to buy overpriced futures. Rather, he should wait for the futures to be near fair value in order to establish the position.

COLLATERAL REQUIREMENTS

In any of the portfolio hedging strategies that we have discussed in this section, there is no reduction in margin requirements for either the futures or the options. That is, the stocks must be paid for in full or margined as if they had no protection against them, and the hedging security – the futures or options – must be margined fully as well. Long puts would have to be paid for in full, short futures would require their normal margin and would be marked to the market via variation margin, and short calls would have to be margined as naked and would also be marked to the market. A trader who has not margined his stocks could use them as collateral for the naked call requirements if he so desired.

SUMMARY

There have been two major impacts of index futures and options. One is that they allow a trader to "buy the market" without having to select individual stocks. This is important because many traders have some idea of the direction in which the market is heading, but may not be able to pick individual stocks well. The other, perhaps more major, impact is that large holders of stocks can now hedge their portfolios without nearly as much difficulty. The use of these futures and options against actual stock indices – real or simulated – has introduced a strategy into the marketplace that did not previously exist. The versatility of these derivative securities is evidenced

That is a substantial amount of movement when one considers that most of our arbitrage examples were assuming profits of not much more than that. The compensating factor to this risk is that the simulated index may outperform the actual index and one could make more profits than would be available with arbitrage. If one had enough capital and enough time to constantly be participating in such a simulated-index strategy, he would, over time, have a tracking error that is relatively small if his simulated index has a high correlation to the index.

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Once the position has been established, the trader should have some way of monitoring the position. Ideally, he would have a computer system that could compute his mini-index in real time. This would allow accurate comparisons between the actual index movement and the mini-index. Tracking error can, of course, work for or against the trader.

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Example: If one is trading against futures that have a trading move of \$500 per point, then he might choose to use 20 futures against his mini-index. That is, the multiplier is 20 × \$500 or \$10,000. If he were hedging against an index trading at 170.25, he would then buy 10,000 × 170.25 or \$1,702,500 worth of stock. The total value of the stocks in his mini-index would total \$1,702,500 initially and he could therefore determine his mini-index value to be 170.2500 by moving the decimal point over four places. The following table summarizes how this might be constructed using the four stocks in the most recent example. Recall that in the previous example, the total capitalization of the four-stock mini-index was \$851,250. In this example we would have had a total mini-index capitalization of twice that, or \$1,702,500. Thus, the capitalization and the number of shares to buy are doubled from the previous example.

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Later, as the stocks change in value, one's computerized profit and loss system could readily compute the total capitalization of the mini-index and, by moving the decimal point over four places, have a "mini-index value" that could be compared against the actual index (UVX in this case) in order to determine tracking error.

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Now, if one obtains the volatilities of these stocks, he can perform the necessary computations. These computations will tell him how many futures to sell against the portfolio of drilling stocks. The volatilities and computations are given in the following table, assuming the market volatility is 15%. First, dividing the stock's volatility by the market's volatility gives the adjusted volatility (step 1). That result multiplied by the price and quantity of the stock gives the adjusted capitalization (step 2), and adding these together gives the total adjusted capitalization (step 3).

Stock	Volatility	Adjusted Volatility (Step 1)	Price	Quantity Owned	Adjusted Capitalization (Step 2)
FLR	.46	3.07	20	5,000	$ 306,667
HAL	.30	2.00	50	2,000	200,000
HT	.21	1.67	25	4,000	166,667
KAB	.50	3.33	10	10,000	333,333
SLE	.35	2.33	40	5,000	233,333
Total adjusted capitalization:					$1,240,000 (step 3)

Assume that one wants to hedge with a fictional index, ZYX, and that ZYX futures are worth $500 per point. If the ZYX Index is selling at 175, then one would sell 14 futures against this portfolio of drilling stocks: $1,240,000 ÷ $500 per point ÷ 175 is approximately equal to 14 (step 4).

In a situation such as this, one does not have to be bullish or bearish on the market in order to establish the hedge. He is rather attempting to time the performance of the group in question. Similarly, the decision as to when to remove the position is not a matter of market opinion. Perhaps one has an unrealized profit and decides to take it, or perhaps something changes fundamentally within the group

that leads the investor to believe that the group no longer has the potential to outperform the market.

If the futures are underpriced when one begins to investigate this strategy, he should not establish the position. What is gained in tracking error could be lost in theoretical value of the futures. Since one is establishing both sides of the hedge (stocks and futures) at essentially the same time, he can afford to wait until the futures are attractively priced. This is not to say that the futures must be overpriced when the position is established, although that fact would be an enhancement to the position.

If one thinks that a particular group will underperform the market, he merely needs to decide how many shares of each stock to sell short and then can determine how many futures to buy against the short sales in order to try to capture the tracking error. If one decides to capture the negative tracking error in this manner, he must be careful not to buy overpriced futures. Rather, he should wait for the futures to be near fair value in order to establish the position.

COLLATERAL REQUIREMENTS

In any of the portfolio hedging strategies that we have discussed in this section, there is no reduction in margin requirements for either the futures or the options. That is, the stocks must be paid for in full or margined as if they had no protection against them, and the hedging security – the futures or options – must be margined fully as well. Long puts would have to be paid for in full, short futures would require their normal margin and would be marked to the market via variation margin, and short calls would have to be margined as naked and would also be marked to the market. A trader who has not margined his stocks could use them as collateral for the naked call requirements if he so desired.

SUMMARY

There have been two major impacts of index futures and options. One is that they allow a trader to "buy the market" without having to select individual stocks. This is important because many traders have some idea of the direction in which the market is heading, but may not be able to pick individual stocks well. The other, perhaps more major, impact is that large holders of stocks can now hedge their portfolios without nearly as much difficulty. The use of these futures and options against actual stock indices – real or simulated – has introduced a strategy into the marketplace that did not previously exist. The versatility of these derivative securities is evidenced

by the various strategies that were described in this chapter – hedging an actual index or a simulated one, trading the tracking error, selling the futures instead of the entire portfolio when one turns bearish, or buying the futures when they are cheap instead of buying stocks. The owner of a stock portfolio, whether an individual or a large institution, should understand these strategies because they are often preferable to merely buying or selling stock.

CHAPTER 31

Index Spreading

In this chapter, we will look at strategies oriented toward spreading one index against another. This may be done with either futures or options. In some cases, this is almost an arbitrage because the indices track each other quite well. In others, it is a high-risk venture because the indices bear little relationship to each other. In any case, if the futures relationship between the two indices is out of line, one may have an extra advantage.

INTER-INDEX SPREADING

There are general relationships between many stock indices, both in the United States and worldwide. The idea behind inter-index spreading is often to capitalize on one's view of the relationships between the two indices without having to actually predict the direction of the stock market. Note that this is often the philosophy behind many option spreads as well.

Sometimes an analyst will say that he expects small-cap stocks to outperform large-cap stocks. This analyst should consider using an inter-index spread between the S&P 500 Index and the Value Line Index (which contains many small stocks), or perhaps between the S&P and a NASDAQ-based index. If he buys the index that is comprised of smaller stocks and sells the S&P 500 Index, he will make money if his analysis is right, regardless of whether the stock market goes up or down. All he wants is for the index he is long to outperform the index he is short.

Occasionally, the futures or options on these indices are mispriced in comparison to the way the indices are priced. When this happens, one may be able to capitalize on the pricing discrepancy. At times, the spread between the index products

on two indices can trade at significantly different price levels from the spread between the two indices themselves. When this happens, an inter-index spread becomes feasible.

The margin requirements for these spreads are often reduced because margin rules recognize that futures on one index can be hedged by futures on another index.

The general rule of thumb as far as selecting a futures spread to establish between two indices is to compare the price difference in the respective futures to the actual price difference in the indices themselves. If the difference in the futures is substantially different from the difference in the cash prices of the indices, then one would sell the more expensive future and buy the cheaper one. Several specific spreads are discussed in this chapter.

Regardless of whether one is entering into the spread because he is trying to predict the relationships between the cash indices, or because he knows the two respective futures are out of line, he must decide in what ratio he wants to establish the spread. There are two lines of thinking on this subject. The first is to merely buy one future and sell one future (on two different indices, of course). Many chart books and spread history charts are graphed in this manner – they compare one index to another index on a one-for-one basis.

Example: A spreader wants to buy the ZYX Index futures and sell ABX futures against them. They are both trading in units of $500 per point, but ZYX is currently at 175.00 while ABX is at 130.00. Thus, the current differential is 45.00 points. This spreader would want the spread to widen to something larger in order to make money. The following profit table shows how he could make a $2,500 profit if the spread widens to 50.00 points, no matter which way the market goes.

Market Direction	ZYX Price	ZYX Profit	ABX Price	ABX Profit	Total Profit
up	185.00	+$5,000	135.00	–$2,500	+$2,500
neutral	177.00	+ 1,000	127.00	+ 1,500	+ 2,500
down	160.00	– 7,500	110.00	+10,000	+ 2,500

Notice that in each case, the difference in the prices of the indices ZYX and ABX is 50.00 points. The profit is the same regardless of whether the general stock market rose, was relatively unchanged, or fell.

The $2,500 profit is the five points of profit that the spreader makes by buying the spread of 45.00 and selling it at 50.00 (5.00 points × $500 per point = $2,500).

The second approach to index spreading is to use a ratio of the two indices. This approach is often taken when the two indices trade at substantially different prices.

For example, if one index sells for twice the price of the other, and if both indices have similar volatilities, then a one-to-one spread gives too much weight to the higher-priced index. A two-to-one ratio would be better, for that would give equal weighting to the spread between the indices.

Example: UVX is an index of stock prices that is currently priced at 100.00. ZYX, another index, is priced at 200.00. The two indices have some similarities and, therefore, a spreader might want to trade one against the other. They also display similar volatilities.

If one were to buy one UVX future and sell one ZYX future, his spread would be too heavily oriented to ZYX price movement. The following table displays that, showing that if both indices have similar percentage movements, the profit of the one-by-one spread is dominated by the profit or loss in the ZYX future. Assume both futures are worth $500 per point.

Market Direction	ZYX Price	ZYX Profit	UVX Price	UVX Profit	Total Profit
up 20%	240	–$20,000	120	+$10,000	–$10,000
up 10%	220	– 10,000	110	+ 5,000	– 5,000
down 10%	180	+ 10,000	90	– 5,000	+ 5,000
down 20%	160	+ 20,000	80	– 10,000	+ 10,000

This is not much of a hedge. If one wanted a position that reflected the movement of the ZYX index, he could merely trade the ZYX futures and not bother with a spread.

If, however, one had used the ratio of the indices to decide how many futures to buy and sell, he would have a more neutral position. In this example, he would buy two UVX futures and sell one ZYX future.

Proponents of using the ratio of indices are attempting strictly to capture any performance difference between the two indices. They are not trying to predict the overall direction of the stock market.

Technically, the proper ratio should also include the volatility of the two indices, because that is also a factor in determining how fast they move in relationship to each other.

$$\text{Ratio} = \frac{v_1}{v_2} \times \frac{p_1}{p_2} \times \frac{u_1}{u_2}$$

where

p_1 and p_2 are the prices of the indices

v_1 and v_2 are the respective volatilities

and u_1 and u_2 are the units of trading ($500 per point, for example).

Including the volatility ensures that one is spreading essentially equal "volatility dollars" of each index. Moreover, if the two futures don't have the same unit of trading, that should be factored in as well.

Example: The ZYX Index is not very volatile, having a volatility of 15%. A trader is interested in spreading it against the ABX Index, which is volatile, having a historical volatility of 25%. The following data sum up the situation:

	Price	Volatility	Unit of Trading
ZYX Futures	175.00	15%	$250/pt
ABX Futures	225.00	25%	$500/pt

$$\text{Ratio} = \frac{.25}{.15} \times \frac{225.00}{175.00} \times \frac{500}{250}$$

$$= 4.286$$

In round numbers, one would probably trade four ZYX futures against one ABX future.

INDEX CHARACTERISTICS

Before discussing specific spreads, it might be constructive to describe how the makeup of the various indices that have listed options affects their price movements. The Value Line Index is composed of 1,600 stocks, some of which are traded over the counter. The Value Line Index movement is much more closely related to how small stocks perform, while the S&P 500 Index reflects more heavily the performance of the large-capitalization stocks. In fact, it has been said that a chart of the Value Line Index looks almost like the advance–decline line (the running daily total of advances minus declines). The S&P 500, on the other hand, looks much more like the Dow-Jones 30 Industrials because of the heavy weighting given the large-capitalization stocks.

The S&P 100 (OEX) contains 100 stocks, but is capitalization-weighted and the stocks are generally the largest ones with listed options trading on the CBOE. Thus, its performance is much more like the S&P 500 and NYSE indices. The OEX is

slightly more volatile than these two larger indices, and also has more technology and less basic industry such as steel and chemicals. The OEX movement definitely has good correlation to the S&P 500. The S&P 500 Index (SPX) currently trades at about twice the "speed" of the OEX Index. This has been true since OEX split 2-for-1 in November 1997. A one-point move in SPX is approximately equal to a move of 7.5 points in the Dow-Jones Industrial Average, while a one-point move in OEX is approximately equal to 15 Dow points.

In general, it is easier to spread the indices by using futures rather than options, although only the S&P 500 Index has liquid futures markets. (There is a mini-Value Line futures market, as well as Dow-Jones futures – both of which are fairly illiquid – but no futures trade on OEX.) One reason for this is liquidity – the index futures markets have large open interest. Another reason is tightness of markets. Futures markets are normally 5 or 10 cents wide, while option markets are 10 cents wide or more. Moreover, an option position that is a full synthetic requires both a put and a call. Thus, the spread in the option quotes comes into play twice.

The Japanese stock market can be spread against the U.S. markets by spreading a U.S. index against Nikkei futures or futures options, traded on the Chicago Merc, or against JPN options, traded on the AMEX.

INTER-INDEX SPREADS USING OPTIONS

As mentioned before, it may not be as efficient to try to use options in lieu of the actual futures spreads since the futures are more liquid. However, there are still many applications of the inter-index strategy using options.

OEX versus S&P 500. The OEX cash-based index options are the most liquid option contracts. Thus, any inter-index spread involving the OEX and other indices must include the OEX options.

The S&P 100 was first introduced in 1982 by the CBOE. It was originally intended to be an S&P 500 look-alike whose characteristics would allow investors who did not want to trade futures (S&P 500 futures) the opportunity to be able to trade a broad index by offering options on the OEX. Initially, the index was known as the CBOE 100, but later the CBOE and Standard and Poor's Corp. reached an agreement whereby the index would be added to S&P's array of indices. It was then renamed the S&P 100.

Initially, the two indices traded at about the same price. The OEX was the more expensive of the two for a while in the early 1980s. As the bull market of the 1980s matured, the S&P 500 ground its way higher, eventually reaching a price nearly 30 points higher than OEX. As one can see, there is ample room for movement in the spread between the cash indices.

The S&P 500 has more stocks, and while both indices are capitalization-weighted, 500 stocks include many smaller stocks than the 100-stock index. Also, the OEX is more heavily weighted by technology issues and is therefore slightly more volatile. Finally, the OEX does not contain several stocks that are heavily weighted in the S&P 500 because those stocks do not have options listed on the CBOE: Procter and Gamble, Philip Morris, and Royal Dutch, to name a few. There are two ways to approach this spread – either from the perspective of the derivative products differential or by attempting to predict the cash spread.

In actual practice, most market-makers in the OEX use the S&P 500 futures to hedge with. Therefore, if the futures have a larger premium – are overpriced – then the OEX calls will be expensive and the puts will be cheap. Thus, there is not as much of an opportunity to establish an inter-index spread in which the derivative products (futures and options in this case) spread differs significantly from the cash spread. That is, the derivative products spread will generally follow the cash spread very closely, because of the number of people trading the spread for hedging purposes.

Nevertheless, the application does arise, albeit infrequently, to spread the premium of the derivative products in two indices on strictly a hedged basis without trying to predict the direction of movement of the cash indices. In order to establish such a spread, one would take a position in futures and an opposite position in both the puts and calls on OEX. Due to the way that options must be executed, one cannot expect the same speed of execution that he can with the futures, unless he is trading from the OEX pit itself. Therefore, there is more of an execution risk with this spread. Consequently, most of this type of inter-index spreading is done by the market-makers themselves. It is much more difficult for upstairs traders and customers.

USING OPTIONS IN INDEX SPREADS

Whenever both indices have options, as most do, the strategist may find that he can use the options to his advantage. This does not mean merely that he can use a synthetic option position as a substitute for the futures position (long call, short put at the same strike instead of long futures, for example). There are at least two other alternatives with options. First, he could use an in-the-money option as a substitute for the future. Second, he could use the options' delta to construct a more leveraged spread. These alternatives are best used when one is interested in trading the spread between the cash indices – they are not really amenable to the short-term strategy of spreading the premiums between the futures.

Using in-the-money options as a substitute for futures gives one an additional advantage: If the cash indices move far enough in either direction, the spreader could

still make money, even if he was wrong in his prediction of the relationship of the cash indices.

Example: The following prices exist:

ZYX: 175.00
UVX: 150.00

ZYX Dec 185 put: 10½
UVX Dec 140 call: 11

Suppose that one wants to buy the UVX index and sell the ZYX index. He expects the spread between the two – currently at 25 points – to narrow. He could buy the UVX futures and sell the ZYX futures. However, suppose that instead he buys the ZYX *put* and buys the UVX *call.*

The time value of the Dec 185 put is 1/2 point and that of the Dec 140 call is 1 point. This is a relatively small amount of time value premium. Therefore, the combination would have results very nearly the same as the futures spread, as long as both options remain in-the-money; the only difference would be that the futures spread would outperform by the amount of the time premium paid.

Even though he pays some time value premium for this long option combination, the investor has the opportunity to make larger profits than he would with the futures spread. In fact, he could even make a profit if the cash spread *widens*, if the indices are volatile. To see this, suppose that after a large upward move by the overall market, the following prices exist:

ZYX: 200.00
UVX: 170.00

ZYX Dec 185 put: 0 (virtually worthless)
UVX Dec 140 call: 30

The combination that was originally purchased for 21½ points is now worth 30, so the spread has made money. But observe what has happened to the cash spread: It has widened to 30 points, from the original price of 25. This is a movement in the opposite direction from what was desired, yet the option position still made money.

The reason that the option combination in the example was able to make money, even though the cash spread moved unfavorably, is because both indices rose so much in price. The puts that were owned eventually became worthless, but the long call continued to make money as the market rose. This is a situation that is very similar to owning a long strangle (long put and call with different strikes), except that

the put and call are based on different underlying indices. This concept is discussed in more detail in Chapter 35 on futures spreads.

The second way to use options in index spreading is to use options that are less deeply in-the-money. In such a case, one must use the deltas of the options in order to accurately compute the proper hedge. He would calculate the number of options to buy and sell by using the formula given previously for the ratio of the indices, which incorporates both price and volatility, and then multiplying by a factor to include delta.

$$\text{Option Ratio} = \frac{v_1}{v_2} \times \frac{p_1}{p_2} \times \frac{u_1}{u_2} \times \frac{d_1}{d_2}$$

where

v_i is the volatility of index $_i$

p_i is the price of index $_i$

u_i is the unit of trading

and d_i is the delta of the selected option on index $_i$

Example: The following data is known:

ZYX: 175.00, volatility = 20%
UVX: 150.00, volatility = 15%

ZYX Dec 175 put: 7, delta = – .45, worth $500/pt.
UVX Dec 150 call: 5, delta = .52, worth $100/pt

Suppose one decides that he wants to set up a position that will profit if the spread between the two cash indices shrinks. Rather than use the deeply in-the-money options, he now decides to use the at-the-money options. He would use the option ratio formula to determine how many puts and calls to buy. (Ignore the put's negative delta for the purposes of this formula.)

$$\text{Option Ratio} = \frac{.20}{.15} \times \frac{175.00}{150.00} \times \frac{500}{100} \times \frac{.45}{.52} = 6.731$$

He would buy nearly 7 UVX calls for every ZYX put purchased.

In the previous example, using in-the-money options, one had a very small expense for time value premium and could profit if the indices were volatile, even if the cash spread did not shrink. This position has a great deal of time value premium expense, but could make profits on smaller moves by the indices. Of course, either one could profit if the cash indices moved favorably.

Volatility Differential. A theoretical "edge" that sometimes appears is that of volatility differential. If two indices are supposed to have essentially the same volatility, or at least a relationship in their volatilities, then one might be able to establish an option spread if that relationship gets out of line. In such a case, the options might actually show up as fair-valued on both indices, so that the disparity is in the volatility differential, and not in the pricing of the options.

OEX and SPX options trade with essentially the same implied volatility. Thus, if one index's options are trading with a higher implied volatility than the other's, a potential spread might exist. Normally, one would want the differential in implied volatilities to be at least 2% apart before establishing the spread for volatility reasons.

In any case, whether establishing the spread because one thinks the cash index relationship is going to change, or because the options on one index are expensive with respect to the options on the other index, or because of the disparity in volatilities, the spreader must use the deltas of the options and the price ratio and volatilities of the indices in setting up the spread.

Striking Price Differential. The index relationships can also be used by the option trader in another way. When an option spread is being established with options whose strikes are not near the current index prices – that is, they are relatively deeply in- or out-of-the-money – one can use the ratio between the indices to determine which strikes are equivalent.

Example: ZYX is trading at 250 and the ZYX July 270 call is overpriced. An option strategist might want to sell that call and hedge it with a call on another index. Suppose he notices that calls on the UVX Index are trading at approximately fair value with the UVX Index at 175. What UVX strike should he buy to be equivalent to the ZYX 270 strike?

One can multiply the ZYX strike, 270, by the ratio of the indices to arrive at the UVX strike to use:

$$\begin{aligned}\text{UVX strike} &= 270 \times (175/250)\\ &= 189.00\end{aligned}$$

So he would buy the UVX July 190 calls to hedge. The exact number of calls to buy would be determined by the formula given previously for option ratio.

SUMMARY

This concludes the discussion of index spreading. The above examples are intended to be an overview of the most usable strategies in the complex universe of index spreading. The multitude of strategies involving inter-index and intra-index spreads cannot all be fully described. In fact, one's imagination can be put to good use in designing and implementing new strategies as market conditions change and as the emotion in the marketplace drives the premium on the futures contracts.

Often one can discern a usable strategy by observation. Watch how two popular indices trade with respect to each other and observe how the options on the two indices are related. If, at a later time, one notices that the relationship is changing, perhaps a spread between the indices is warranted. One could use the NASDAQ-based indices, such as the NASDAQ-100 (NDX) or smaller indices based on it (QQQ or MNX). Sector indices can be used as well. This brings into play a fairly large number of indices with listed options (few, if any, of which have futures), such as the Semiconductor Index (SOX), the Oil & Gas Index (XOI), the Gold and Silver Index (XAU), etc. The key point to remember is that the index option and futures world is more diverse than that of stock options. Stock option strategies, once learned or observed, apply equally well to all stocks. Such is not the case with index spreading strategies. The diversification means that there are more profit opportunities that are recognized by fewer people than is the case with stock options. The reader is thus challenged to build upon the concepts described in this part of the book.

CHAPTER 32

Structured Products

The popularity of derivative instruments and the kinds of risk-reducing, volatility-reducing effects that they can have on portfolios led to a new type of product in the 1990s. This new product, termed a *structured product,* has more appeal for investors than for traders. In essence, enterprising designers at the major institutional brokerage firms have constructed a single security that behaves like a portfolio hedged by options. These designers *structure* the combination of derivatives and stocks so that the resulting *product* behaves in a manner that is attractive to many investors, whether institutional or private. In this chapter, these structured products are examined in detail, to give the reader the background so that in the future, he may analyze similar products for himself.

Would you like to own an index fund that had no risk? Or, how about owning a popular stock and getting a dividend payment that is much, much larger than the stock itself pays? I think everyone would like to do those things. With structured products, one *can* own similar investments, but they come with a cost. The two questions asked previously might then be better restated as follows: Would you like to own an index fund that had no risk, but that perhaps did not fully participate in *all* of the upside movement of the market? It still has downside protection, and unlimited profit potential on the upside. This is akin to owning the stock or the index and having protected it by buying a put option. Or, would you like to own that popular stock and receive that huge dividend, but know that your profit potential is limited to a fixed amount on the upside? This is akin to a covered call write.

These two questions describe the majority of the listed structured products in existence today. They are attractive investments in their own right, but one must carefully assess the products before buying them. This chapter is divided into two main parts to discuss the two types of products: First, we'll discuss the "protected" stock or index. Later, the discussion will turn to "covered write" products.

The discussion in this chapter concentrates on the structured products that are *listed* and traded on the major stock exchanges. A broader array of products – typically called exotic options – is traded over-the-counter. These can be very complicated, especially with respect to currency and bond options. It is not our intent to discuss exotic options, although the approaches to valuing the structured products that are presented in this chapter can easily be applied to the overall valuation of many types of exotic products. Also, the comments at the end of the chapter regarding where to find information about these products may prove useful for those seeking further information about either listed structured products or exotic options.

Part I: "Riskless" Ownership of a Stock or Index

THE "STRUCTURE" OF A STRUCTURED PRODUCT

At many of the major institutional banks and brokerages, people are employed who design structured products. They are often called financial engineers because they take existing financial products and build something new with them. The result is packaged as a fund of sorts (or a unit trust, perhaps), and shares are sold to the public. Not only that, but the shares are then listed on the American or New York Stock Exchanges and can be traded just like any other stock. These attributes make the structured product a very desirable investment. An example will show how a generic index structured product might look.

Example: Let's look at the structured index product to see how it might be designed and then how it might be sold to the public. Suppose that the designers believe there is demand for an index product that has these characteristics:

1. This "index product" will be issued at a low price – say, \$10 per share.
2. The product will have a maturity date – say, seven years hence.
3. The owner of these shares can redeem them at their maturity date for the *greater of:* either a) \$10 per share or b) the percentage appreciation of the S&P 500 index over that seven-year time period. That is, if the S&P doubles over the seven years, then the shares can be redeemed for double their issue price, or \$20.

Thus, this product has no price risk! The holder gets his \$10 back in the worst case (except for credit risk, which will be addressed in a minute).

Moreover, these shares will trade in the open market during the seven years, so that if the holder wants to exit at any time, he can do so. Perhaps the S&P has rallied

dramatically, or perhaps he needs cash for something else – both might be reasons that the holder of the shares would want to sell before maturity.

Such a product has appeal to many investors. In fact, if one thought that the stock market was a "long-term" buy, this would be a much safer way to approach it than buying a portfolio of stocks that might conceivably be much lower in value seven years hence. *The risk of the structured product is that the underwriter might not be able to pay the $10 obligation at maturity.* That is, if the major institutional bank or brokerage firm who underwrote these products were to go out of business over the course of the next seven years, one might not be able to redeem them. In essence, then, structured products are really forms of debt (senior debt) of the brokerage firm that underwrote them. Fortunately, most structured products are underwritten by the largest and best-capitalized institutions, so the chances of a failure to pay at maturity would have to be considered relatively tiny.

How does the bank create these items? It might seem that the bank buys stock and buys a put and sells units on the combined package. In reality, the product is *not* normally structured that way. Actually, it is not a difficult concept to grasp. This example shows how the structure looks from the viewpoint of the bank:

Example: Suppose that the bank wants to raise a pool of $1,000,000 from investors to create a structured product based on the appreciation of the S&P 500 index over the next seven years. The bank will use a part of that pool of money to buy U.S. zero-coupon bonds and will use the rest to buy call options on the S&P 500 index.

Suppose that the U.S. government zero-coupon bonds are trading at 60 cents on the dollar. Such bonds would mature in seven years and pay the holder $1.00. Thus, the bank could take $600,000 and buy these bonds, knowing that in seven years, they would mature at a value of $1,000,000. The other $400,000 is spent to buy call options on the S&P 500 index. Thus, the investors would be made whole at the end of seven years even if the options that were bought expired worthless. This is why the bank can "guarantee" that investors will get their initial money back.

Meanwhile, if the stock market advances, the $400,000 worth of call options will gain value and that money will be returned to the holders of the structured product as well.

In reality, the investment bank uses its own money ($1,000,000) to buy the securities necessary to structure this product. Then they make the product into a legal entity (often a unit trust) and sell the shares (units) to the public, marking them up slightly as they would do with any new stock brought to market.

At the time of the initial offering, the calls are bought at-the-money, meaning the striking price of the calls is equal to the closing price of the S&P 500 index on the

day the products were sold to the public. Thus, the structured product itself has a "strike price" equal to that of the calls. It is this price that is used at maturity to determine whether the S&P has appreciated over the seven-year period – an event that would result in the holders receiving back more than just their initial purchase price.

After the initial offering, the shares are then listed on the AMEX or the NYSE and they will begin to rise and fall as the value of the S&P 500 index fluctuates.

So, the structured product is not an index fund protected by a put option, but rather it is a combination of zero-coupon government bonds and a call option on an index. These two structures are equivalent, just as the combination of owning stock protected by a put option is equivalent to being long a call option.

Structured products of this type are not limited to indices. One could do the same thing with an individual stock, or perhaps a group of stocks, or even create a simulated bull spread. There are many possibilities, and the major ones will be discussed in the following sections. In theory, one could construct products like this for himself, but the mechanics would be too difficult. For example, where is one going to buy a seven-year option in small quantity? Thus, it is often worthwhile to avail oneself of the product that is packaged (structured) by the investment banker.

In actuality, many of the brokerage firms and investment banks that underwrite these products give them names – usually acronyms, such as MITTS, TARGETS, BRIDGES, LINKS, DINKS, ELKS, and so on. If one looks at the listing, he may see that they are called *notes* rather than *stocks* or *index funds*. Nevertheless, when the terms are described, they will often match the examples given in this chapter.

INCOME TAX CONSEQUENCES

There is one point that should be made now: There is "phantom interest" on a structured product. Phantom interest is what one owes the government when a bond is bought at a discount to maturity. The IRS technically calls the initial purchase price an Original Issue Discount (OID) and requires you to pay taxes annually on a proportionate amount of that OID. For example, if one buys a zero-coupon U.S. government bond at 60 cents on the dollar, and later lets it mature for $1.00, the IRS does not treat the 40-cent profit as capital gains. Rather, the 40 cents is interest income. Moreover, says the IRS, you are collecting that income each year, since you bought the bonds at a discount. (In reality, of course, you aren't collecting a thing; your investment is simply worth a little more each year because the discount decreases as the bonds approach maturity.) However, *you must pay income tax on the "phan-*

tom interest" you supposedly received each year. Those are the rules, and there isn't anything you can do about them.

Since some structured products involve the purchase of zero-coupon bonds, the IRS has ruled that *owners of this type of structured product must pay phantom interest each year.* Thus, structured products should be bought in a tax-free retirement account (IRA, SEP, etc.) if at all possible, in order to avoid having to declare phantom interest on your tax return for each year you hold the product. The phantom interest tax applies only to this type of structured product – one on which you are guaranteed to get back a fixed amount at maturity – because this is the only type that requires buying a zero-coupon bond in order to ensure that you'll get your money back if the stock market goes down. The phantom interest concept does *not* apply to the type of structured product to be discussed in the second part of this chapter. To be certain, one should get the necessary information from his broker or should read the prospectus of the structured product. Of course, any tax strategies should also be discussed with a qualified tax professional.

CASH VALUE

The cash value of the structured product is what it will be worth at maturity. It is usually stated in terms similar to those in the preceding example, and a formula is often given. This example will clarify the typical nature of this formula:

Example: A structured product is issued at \$10 per share. The terms stipulate that the holder will receive back, at maturity, either \$10 or 100% of the appreciation of the S&P 500 index above a value of 1,245.27. (One would assume that the S&P 500 cash index closed at 1,245.27 on the day the structured product was issued.) The prospectus will usually provide a formula for the cash surrender value, and it will be stated something like this:

At maturity, the cash value will be equal to the <u>greater of</u>:

(a) \$10

or (b) \$10 + 10 × (Final Index Value - 1,245.27) / 1,245.27

where Final Index Value is, say, the closing value of the S&P 500 index on the maturity date.

The formula given is merely the arithmetic equivalent of the statement that one will receive 100% of the appreciation of the S&P 500 Index above the strike price of 1,245.27. For those more adept at math, the formula can be reduced to common terms, in which case it reads:

$$\text{Cash Surrender Value} = \$10 \times \text{Final Value} / 1{,}245.27$$

This shortened version of the formula only works, though, when the participation rate is 100% of the increase in the Final Index Value above the striking price. Otherwise, the longer formula should be used.

Not all structured products of this type offer the holder 100% of the appreciation of the index over the initial striking price. In some cases, the percentage is smaller (although in the early days of issuance, some products offered a percentage appreciation that was actually *greater* than 100%). After 1996, options in general became more expensive as the volatility of the stock market increased tremendously. Thus, structured products issued after 1997 or 1998 tend to include an "annual adjustment factor." Adjustment factors are discussed later in the chapter.

Therefore, a more general formula for Cash Surrender Value – one that applies when the participation rate is a fixed percentage of the striking price – is:

$$\text{Cash Surrender Value} = \text{Guarantee} + \text{Guarantee} \times \text{Participation Rate} \times (\text{Final Index Value} / \text{Striking Price} - 1)$$

THE COST OF THE IMBEDDED CALL OPTION

Few structured products pay dividends.[1] Thus, the "cost" of owning one of these products is the interest lost by not having your money in the bank (or money market fund), but rather having it tied up in holding the structured product.

Continuing with the preceding example, suppose that you had put the $10 in the bank instead of buying a structured product with it. Let's further assume that the money in the bank earns 5% interest, compounded continuously. At the end of seven years, compounded continuously, the $10 would be worth:

$$\begin{aligned}\text{Money in the bank} &= \text{Guarantee Price} \times e^{rt} \\ &= \$10 \times e^{0.05 \times 7} = 14.191, \text{ in this case}\end{aligned}$$

This calculation usually raises some eyebrows. Even compounded annually, the amount is 14.07. You would make roughly 40% (without considering taxes) just by

[1]Some do pay dividends, though. A structured product existed on a contrived index, called the Dow-Jones Top 10 Yield index (symbol: $XMT). This is a sort of "dogs of the Dow" index. Since part of the reason for owning a "dogs of the Dow" product is that dividends are part of the performance, the creators of the structured product (Merrill Lynch) stated that the minimum price one would receive at maturity would be 12.40, not the 10 that was the initial offering price. Thus, this particular structured product had a "dividend" built into it in the form of an elevated minimum price at maturity.

having your money in the bank. Forgetting structured products for a moment, this means that stocks in general would have to increase in value by over 40% during the seven-year period just for your performance to beat that of a bank account.

In this sense, the cost of the imbedded call option in the structured product is this lost interest – 4.19 or so. That seems like a fairly expensive option, but if you consider that it's a seven-year option, it doesn't seem quite so expensive. In fact, one could calculate the implied volatility of such a call and compare it to the current options on the index in question.

In this case, with the stock at 10, the strike at 10, no dividends, a 5% interest rate, and seven years until expiration, the implied volatility of a call that costs $4.19 is 28.1%. Call options on the S&P 500 index are rarely that expensive. So you can see that you are paying "something" for this call option, even if it *is* in the form of lost interest rather than an up-front cost.

As an aside, it is also unlikely that the underwriter of the structured product actually paid that high an implied volatility for the call that was purchased; but he is asking *you* to pay that amount. This is where his underwriting profit comes from.

The above example assumed that the holder of the structured product is participating in 100% of the upside gain of the underlying index over its striking price. If that is not the case, then an adjustment has to be made when computing the price of the imbedded option. In fact, one must compute what value of the index, at maturity, would result in the cash value being equal to the "money in the bank" calculation above. Then calculate the imbedded call price, using *that* value of the index. In that way, the true value of the imbedded call can be found.

You might ask, "Why not just divide the 'money in the bank' formula by the participation rate?" That would be okay if the participation were always stated as a percentage of the striking price, but sometimes it is not, as we will see when we look at the more complicated examples. Further examples of structured products in this chapter demonstrate this method of computing the cost of the imbedded call.

PRICE BEHAVIOR PRIOR TO MATURITY

The structured product cannot normally be "exercised" by the holder until it matures. That is, the cash surrender value is only applicable at maturity. At any other time during the life of the product, one can *compute* the cash surrender value, but he cannot actually attain it. What you *can* attain, prior to maturity, is the *market price,* since structured products trade freely on the exchange where they are listed. In actual fact, the products generally trade at a slight discount to their theoretical cash surrender value. This is akin to a closed-end mutual fund selling at a discount to net

asset value. Eventually, upon maturity, the actual price will *be* the cash surrender value price; so if you bought the product at a discount, you would benefit, providing you held all the way to maturity.

Example: Assume that two years ago, a structured product was issued with an initial offering price of $10 and a strike price of 1,245.27, based upon the S&P 500 index. Since issuance, the S&P 500 index has risen to 1,522.00. That is an increase of 22.22% for the S&P 500, so the structured product has a theoretical cash surrender value of 12.22. I say "theoretical" because that value cannot actually be realized, since the structured product is not exercisable at the current time – five years prior to maturity.

In the real marketplace, this particular structured product might be trading at a price of 11.75 or so. That is, it is trading at a *discount* to its theoretical cash surrender value. This is a fairly common occurrence, both for structured products and for closed-end mutual funds. If the discount were large enough, it should serve to attract buyers, for if they were to hold to maturity, they would make an extra 47 cents (the amount of this discount) from their purchase. That's 4% (0.47 divided by 11.75 = 4%) over five years, which is nothing great, but it's something.

Why does the product trade at a discount? Because of supply and demand. It is free to trade at any price – premium or discount – because there is nothing to keep it fixed at the theoretical cash surrender value. If there is excess demand or supply in the open market, then the price of the structured product will fluctuate to reflect that excess. Eventually, of course, the discount will disappear, but five years prior to maturity, one will often find that the product differs from its theoretical value by somewhat significant amounts. If the discount is large enough, it will attract buyers; alternatively, if there should be a large premium, that should attract sellers.

SIS

One of the first structured products of this type that came to my attention was one that traded on the AMEX, entitled "Stock Index return Security" or SIS. It also traded under the symbol SIS. The product was issued in 1993 and matured in 2000, so we have a complete history of its movements. The terms were as follows: The underlying index was the S&P Midcap 400 index (symbol: $MID). Issued in June 1993, the original issue price was $10, and $MID was trading at 166.10 on the day of issuance, so that was the striking price. Moreover, buyers were entitled to 115% of the appreciation of $MID above the strike price. Thus, the cash value formula was:

Cash value of SIS = \$10 + \$10 × 1.15 × (\$MID – 166.10) / 166.10

where

Guarantee price = \$10

Underlying index: S&P Midcap 400 (\$MID)

Striking price: 166.10

Participation rate: 115% of the increase of \$MID above 166.10

SIS matured seven years later, on June 2, 2000. At the time of issuance, seven-year interest rates were about 5.5%, so the "money in the bank" formula shows that one could have made about 4.7 points on a \$10 investment, just by utilizing risk-free government securities:

$$\text{Money in the bank} = 10 \times e^{0.055 \times 7} = 14.70$$

We can't simply say that the cost of the imbedded call was 4.7 points, though, because the participation rate is not 100% – it's greater. So we need to find out the Final Value of \$MID that results in the cash value being equal to the "money in the bank" result. Using the cash value formula and inserting all the terms except the final value of \$MID, we have the following equation. Note: $\$MID_{MIB}$ stands for the value of \$MID that results in the "money in the bank" cash value, as computed above.

$$14.70 = 10 + 10 \times 1.15 \times (\$\text{MID}_{\text{MIB}} - 166.10) / 166.10$$

Solving for $\$\text{MID}_{\text{MIB}}$, we get a value of 233.98. Now, convert this to a percent gain of the striking price:

$$\text{Imbedded call price} = 233.98 / 166.10 - 1 = 0.4087$$

Hence, the imbedded call costs 40.87% of the guarantee price. In this example, where the guarantee price was \$10, that means the imbedded call cost \$4.087.

Thus, a more generalized formula for the value of the imbedded call can be construed from this example. This formula only works, though, where the participation rate is a fixed percentage of the strike price.

$$\text{Imbedded call value} = \text{Guarantee price} \times (\text{Final Index Value}_{\text{MIB}} / \text{Striking Price} - 1)$$

Final Index Value$_{MIB}$ is the final index price that results in the cash value being equal to the "money in the bank" calculation, where

Money in the bank = Guarantee Price × e^{rt}

r = risk-free interest rate

t = time to maturity

Thus, the calculated value of the imbedded call was approximately 4.087 points, which is an implied volatility of just over 26%. At the time, listed short-term options

on $MID were trading with an implied volatility of about 14%, so this was an expensive call in terms of its initial cost.

However, one should remember that owning SIS gave one *more than* full participation in the $MID for seven years, with virtually no risk. That has to be worth something.

As it turned out, $MID was strong during this seven-year period, and SIS wound up being worth just over $30 per share. So, in the end, the owner of SIS tripled his money in seven years and had no risk to begin with. Not a bad scenario.

SIS TRACK RECORD

What SIS also imparts to us, though, is a track record of how it traded during its life. Figure 32-1 shows the discount at which SIS traded during its lifetime. It is the lower line on the chart. The upper line is the corresponding cash value on the same dates. Note that the upper line has the exact same shape as the S&P Midcap 400 ($MID) would, since it is merely $MID multiplied by some arithmetic constant. The graph of the discount is rather "choppy" because it uses last sales of SIS to compute the discount. In reality, since SIS was a somewhat low-volume security, the last sale was not always representative of the closing bid–asked market in SIS. Nevertheless, the graph shows that the discount was greater than 2 points at the left side of the graph (1995) and gradually decreased until it reached zero near maturity (2000).

The graph in Figure 32-1 is useful because it encompasses cases where $MID traded both above and below the striking price of 166.10. No matter whether SIS was in-the-money ($MID above 166.1) or out-of-the-money, SIS traded at a discount. As mentioned previously, this is akin to a closed-end mutual fund trading at a discount to net asset value.

At a minimum, this discount allows the buyer of SIS to add an additional component of overall return to his investment. Also, in some cases – when $MID was trading below the striking price – the buyer of SIS actually has a guaranteed return, as one might have with a bond paying interest or a stock paying a dividend. The examples in the next section examine those situations.

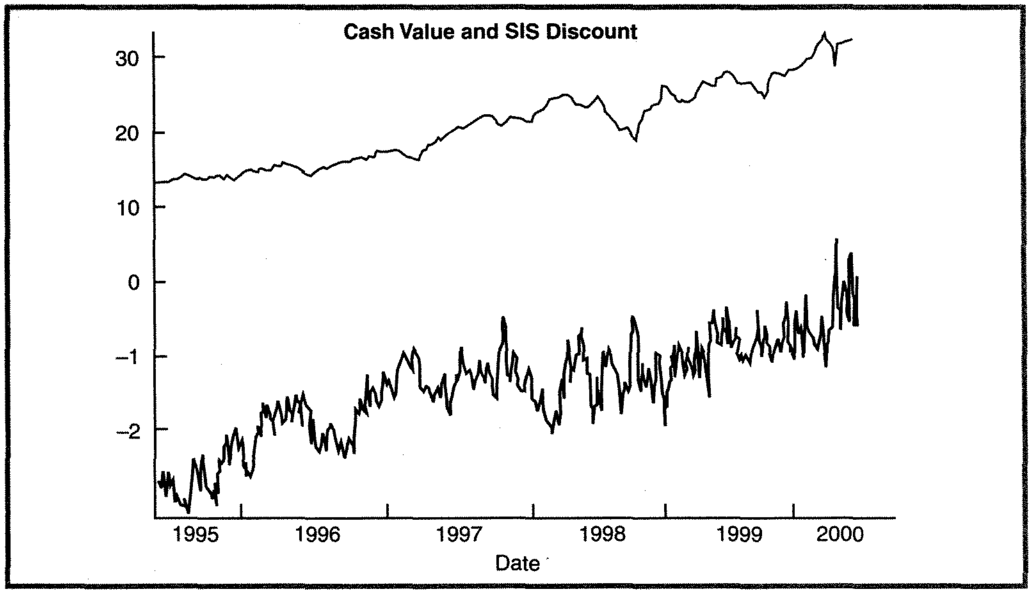
SIS TRADING AT A DISCOUNT TO CASH VALUE

When SIS is trading at a discount to cash value, the buyer of SIS actually has some downside protection.

Example: In late 1996, $MID closed at 238.54 one day, and SIS closed at 13. The cash value of SIS for that price of $MID is:

$$\text{Cash Value} = 10 + 10 \times 1.15 \times (238.54/166.10 - 1) = 15.02$$

FIGURE 32-1.
SIS trading at a discount.



Therefore, SIS is trading at almost exactly a 2-point discount to cash value. That is a fairly large discount of 15.4% (2/13 = .154).

One way to look at this would be to say that an investor is making an "extra" 15.4% on his investment. That is, if $MID were at exactly the same price at expiration, the cash value would be the settlement price – 15.02. In other words, the "stock market" as measured by $MID was exactly unchanged. However, the investor would make a return of 15.4% because he bought SIS at a discount.

In fact, no matter where $MID is at maturity, the investor feels the positive effect of having bought at a discount.

Thus, the discount can and should be perceived as adding to the overall return of owning the structured product. These discounts to net asset value are commonplace with structured products. However, there is another way to view it: as downside protection.

Example: Using the same prices, $MID is at 238.54 and SIS is at 13 – a 15.4% discount to the cash value of 15.02. Another way to view what this discount means is to view it as downside protection. In other words, $MID could decline in price by maturity and this investor could still break even. The exact amount of the downside protection can be calculated. Essentially, one wants to know, at what price for $MID would the cash value be 13?

Solving the following equation for \$MID would give the desired answer:

$$\begin{aligned} \text{Cash Value} = 13 &= 10 + 11.5 \times (\$MID/166.1 - 1) \\ 3 &= 11.5 \times \$MID / 166.1 - 11.5 \\ 14.5 \times 166.1 / 11.5 &= \$MID \\ 209.43 &= \$MID \end{aligned}$$

So, if \$MID were at 209.43, the cash value would be 13 – the price the investor is currently paying for SIS. This is protection of 12.2% down from the current price of 238.54. That is, \$MID could decline 12.2% at maturity, from the current price of 238.54 to a price of 209.43, and the investor who bought SIS would break even because it would still have a cash value of 13.

Of course, this discount could have been computed using the SIS prices of 13 and 15.02 as well, but many investors prefer to view it in terms of the underlying index – especially if the underlying is a popular and often-cited index such as the S&P 500 or Dow-Jones Industrials.

From Figure 32-1, it is evident that the discount persisted throughout the entire life of the product, shrinking more or less linearly until expiration.

SIS TRADING AT A DISCOUNT TO THE GUARANTEE PRICE

In the previous example, the investor could have bought SIS at a discount to its cash value computation, but if the stock market had declined considerably, he would still have had exposure from his SIS purchase price of 13 down to the guarantee price of 10. The discount would have mitigated his percentage loss when compared to the \$MID index itself, but it would be a loss nevertheless.

However, there are sometimes occasions when the structured product is trading at a discount not only to cash value, but also to the guarantee price. This situation occurred frequently in the early trading life of SIS. From Figure 32-1, you can see that in 1995 the cash value was near 11, but SIS was trading at a discount of more than 2 points. In other words, SIS was trading below its guarantee price, while the cash value was actually *above* the guarantee price. It is a "double bonus" for an investor when such a situation occurs.

Example: In February 1995, the following prices existed:

\$MID:	177.59
SIS:	8.75

For a moment, set aside considerations of the cash value. If one were to buy SIS at 8.75 and hold it for the 5.5 years remaining until maturity, he would make 1.25 points on his 8.75 investment – a return of 14.3% for the 5.5-year holding period. As a compounded rate of interest, this is an annual compound return of 2.43%.

Now, a rate of return of 2.43% is rather paltry considering that the risk-free T-bill rate was more than twice that amount. However, in this case, you own a call option on the stock market and get to earn 2.43% per year while you own the call. In other words, *"they" are paying you to own a call option!* That's a situation that doesn't arise too often in the world of listed options.

If we introduce cash value into this computation, the discrepancy is even larger. Using the $MID price of 177.59, the cash value can be computed as:

$$\text{Cash Value} = 10 + 11.5 \times (177.59/166.10 - 1) = 10.80$$

Thus, with SIS trading at 8.75 at that time, it was actually trading at a whopping 19% discount to its cash value of 10.80. Even if the stock market declined, the guarantee price of 10 was still there to provide a minimal return.

In actual practice, a structured product will not normally trade at a discount to its guarantee price while the cash value is *higher* than the guarantee price. There's only a narrow window in which that occurs.

There have been times when the stock market has declined rather substantially while these products existed. We can observe the discounts at which they then traded to see just how they might actually behave on the downside if the stock market declined after the initial offering date. Consider this rather typical example:

Example: In 1997, Merrill Lynch offered a structured product whose underlying index was Japan's Nikkei index. At the time, the Nikkei was trading at 20,351, so that was the striking price. The participation rate was 140% of the increase of the Nikkei above 20,351 – a very favorable participation rate. This structured product, trading under the symbol JEM, was designed to mature in five years, on June 14, 2002.

As it turned out, that was about the peak of the Japanese market. By October of 1998, when markets worldwide were having difficulty dealing with the Russian debt crisis and the fallout from a major hedge fund in the U.S. going broke, the Nikkei had plummeted to 13,300. Thus, the Nikkei would have had to increase in price by just over 50% merely to get back to the striking price. Hence, it would not appear that JEM was ever going to be worth much more than its guarantee price of 10.

Since we have actual price histories of JEM, we can review how the marketplace viewed the situation. In October 1998, JEM was actually trading at 8.75 – only 1.25 points below its guarantee price. That discount equates to an annual compounded rate of 3.64%. In other words, if one were to buy JEM at 8.75 and it matured at 10 about 40 months later, his return would have been 3.64% compounded annually. That by itself is a rather paltry rate of return, but one must keep in mind that he also would own a call option on the Nikkei index, and that option has a 140% participation rate on the upside.

COMPUTING THE VALUE OF THE IMBEDDED CALL WHEN THE UNDERLYING IS TRADING AT A DISCOUNT

Can we compute the value of the imbedded call when the structured product itself is trading at a discount to its guarantee price? Yes, the formulae presented earlier can always be used to compute the value of the imbedded call.

Example: Again using the example of JEM, the structured product on the Nikkei index, recall that it was trading at 8.75 with a guaranteed price of 10, with maturity 40 months hence. Assume that the risk-free interest rate at the time was 5.5%. Assuming continuous compounding, \$8.75 invested today would be worth \$10.51 in 40 months.

Money in the bank = $8.75 \times e^{rt}$
where $r = 0.05$ and $t = 3.33$ years (40 months)
Money in the bank = $8.75 \times e^{0.055 \times 3.333} = 10.51$

Since the structured product will be worth 10 at maturity, the value of the call is 0.51.

There is another, nearly equivalent way to determine the value of the call. It involves determining where the structured product would be trading if it were completely a zero-coupon debt of the underwriting brokerage. The difference between that value and the actual trading price of the structured product is the value of the imbedded call.

The credit rating of the underwriter of the structured product is an important factor in how large a discount occurs. Recall that the guarantee price is only as good as the creditworthiness of the underwriter. The underwriter is the one who will pay the cash settlement value at maturity – not the exchange where the product is listed nor any sort of clearinghouse or corporation.

THE ADJUSTMENT FACTOR

In recent years, some of the structured products have been issued with an *adjustment factor.* The adjustment factor is generally a negative thing for investors, although the underwriters try to couch it in language that makes it difficult to discern what is going on. Simply put, the adjustment factor is a multiplier (less than 100%) applied to the underlying index value *before* calculating the Final Cash Value. Adjustment factors seemed to come into being at about the time that index option implied volatility began to trade at much higher levels than it ever had (1997 onward).

Example: A structured product is issued at an initial price of \$10. It ostensibly allows one to participate in the appreciation of the S&P 500 index over a price of 1,100.00. However, upon closer inspection, what the product really offers is the opportunity for one to participate in the appreciation of the S&P 500 index (\$SPX) *over an adjusted value,* which is a percentage of the \$SPX price – not the actual price itself. The cash value settlement formula is stated as:

Cash settlement value = 10 + 10 × (Adjusted \$SPX – 1,100.00) / 1,100.00

The formula looks similar to the "normal" cash settlement value formulae shown earlier in the chapter, but the term "adjusted \$SPX" has yet to be defined. In fact, it is defined as *a percentage of the final \$SPX Price* – 91.25% in this case. In reality, the prospectus says something to the effect that the final price of \$SPX will be adjusted downward by an annual adjustment factor of 1.25%. Thus, at the end of the seven-year maturity period, the total adjustment factor would be seven times 1.25%, or 8.75%. The adjusted value is then equal to 100% – 8.75%, or 91.25%.

The adjustment factor is an onerous burden for the investor. It means that the final value of \$SPX will be reduced by the adjustment factor *before* it is determined how far, or if at all, \$SPX is above the striking price of 1,100.00.

Example: Suppose that \$SPX exactly doubles in price during the life of the example structured product. That is, it finishes at 2,200.00 – exactly twice the amount of the striking price. Before the cash settlement value can be determined, \$SPX must be adjusted:

\$SPX adjusted value = 0.9125 × 2,200.00 = 2,007.50

So the final cash settlement value is based on the adjusted value of \$SPX:

Cash settlement value = 10 + 10 × (2,007.50 – 1,100.00)/1,100.00 = 18.25

Hence, instead of doubling your money, as you might expect to do since the \$SPX Index doubled in price, you "only" make 82.5%.

Another way to view it: If the index doubles, then the structured product "should" be worth double the initial price, or 20. But instead, it's worth 91.25% of 20, or 18.25.

Carrying the example a little further, suppose that \$SPX had *tripled* in price by the maturity date, and was thus at 3,300. In this case, the cash settlement value would be:

\$SPX adjusted value = 0.9125 × 3,300.00 = 3,011.25
Cash settlement value = 10 + 10 × (3,011.25 – 1,100.00)/1,100.00 = 27.375

Or, thinking in the alternative, if the index triples, then the structured product (before adjustment factor) would be triple its initial price, or 30. Then 30 × 91.25% = 27.375.

This example begins to demonstrate just how onerous the adjustment factor is. Notice that if the underlying doubles, you don't make "double" less 8.75% (the adjustment factor). No, you make "double" *times* the adjustment factor – 17.5% – less than double. In the case of tripling, you make 3 × 8.75%, or 26.25%, less than triple (i.e., the structured product is worth 27.375, not 30, so the percentage increase was 173.75%, not 200% – a difference of 26.25%, stated in terms of the initial investment). How can that be? It is a result of the adjustment factor being applied to the $SPX price *before* your profit (cash settlement value) is computed.

THE BREAK-EVEN FINAL INDEX VALUE

Before discussing the adjustment factor in more detail, one more point should be made: The owner of the structured product doesn't get back anything more than the base value unless the underlying has increased by at least a fixed amount at maturity. In others words, the underlying must appreciate to a price large enough that the final price times the adjustment factor is greater than the striking price of the structured product. We'll call this price the *break-even final index value.*

An example will demonstrate this concept.

Example: As in the preceding example, suppose that the striking price of the structured product is 1,100 and the adjustment factor is 8.75%. At what price would the final cash settlement value be something *greater* than the base value of 10? That price can be solved for with the following simple equation:

Break-even final index value = Striking price / (1 – Adjustment factor)
= 1,100 / (0.9125) = 1,205.48.

Generally speaking, the underlying index must increase in value by a specific amount just to break even. In this case that amount is:

1 / (1 – Adjustment factor) = 1 / 0.9175 = 1.0959

In other words, the underlying index must increase in value by more than 9.5% by maturity just to overcome the weight of the adjustment factor. If the index increases by a lesser amount, then the structured product holder will merely receive back his base value (10) at maturity.

The previous examples all show that the adjustment factor is not a trivial thing. At first glance, one might not realize just how burdensome it is. After all, one might

ask himself, what does 1.25% per year really matter? However, you can see that it *does* matter. In fact, our above examples did not even factor in the other cost that any investor has when his money is at risk – the cost of carry, or what he could have made had he just put the money in the bank.

MEASURING THE COST OF THE ADJUSTMENT FACTOR

The magnitude of the adjustment increases as the price of the underlying increases. It is an unusual concept. We know that the structured product initially had an imbedded call option. Earlier in this chapter, we endeavored to price that option. However, with the introduction of the concept of an adjustment factor, it turns out that the call option's cost is not a fixed amount. It varies, depending on the *final value* of the underlying index. In fact, the cost of the option is a percentage of the final value of the index. Thus, we can't really price it at the beginning, because we don't know what the final value of the index will be. In fact, we have to cease thinking of this option's cost as a fixed number. Rather, it is a geometric cost, if you will, for it increases as the underlying does.

Perhaps another way to think of this is to visualize what the cost will be in percentage terms. Figure 32-2 compares how much of the percent increase in the index is captured by the structured product in the preceding example. The x-axis on the graph is the percent increase by the index. The y-axis is the percent realized by the structured product. The terms are the same as used in the previous examples: The strike price is 1,100, the total adjustment factor is 8.75%, and the guarantee price of the structured product is 10.

The dashed line illustrates the first example that was shown, when a doubling of the index value (an increase of 100%) to 2,200 resulted in a gain of 83.5% in the price of the structured. Thus, the point (100%, 83.5%) is on the line on the chart where the dashed lines meet.

Figure 32-2 points out just how little of the percent increase one captures if the underlying index increases only modestly during the life of the structured product. We already know that the index has to increase by 9.59% just to get to the break-even final price. That point is where the curved line meets the x-axis in Figure 32-2.

The curved line in Figure 32-2 increases rapidly above the break-even price, and then begins to flatten out as the index appreciation reaches 100% or so. This depicts the fact that, for small percentage increases in the index, the 8.75% adjustment factor – which is a flat-out downward adjustment in the index price – robs one of most of the percentage gain. It is only when the index has doubled in price or so that the curve stops rising so quickly. In other words, the index has increased enough in value that the structured product, while not capturing *all* of the percentage gain by any means, is now capturing a great deal of it.

Or, thinking in the alternative, if the index triples, then the structured product (before adjustment factor) would be triple its initial price, or 30. Then 30 × 91.25% = 27.375.

This example begins to demonstrate just how onerous the adjustment factor is. Notice that if the underlying doubles, you don't make "double" less 8.75% (the adjustment factor). No, you make "double" *times* the adjustment factor – 17.5% – less than double. In the case of tripling, you make 3 × 8.75%, or 26.25%, less than triple (i.e., the structured product is worth 27.375, not 30, so the percentage increase was 173.75%, not 200% – a difference of 26.25%, stated in terms of the initial investment). How can that be? It is a result of the adjustment factor being applied to the $SPX price *before* your profit (cash settlement value) is computed.

THE BREAK-EVEN FINAL INDEX VALUE

Before discussing the adjustment factor in more detail, one more point should be made: The owner of the structured product doesn't get back anything more than the base value unless the underlying has increased by at least a fixed amount at maturity. In others words, the underlying must appreciate to a price large enough that the final price times the adjustment factor is greater than the striking price of the structured product. We'll call this price the *break-even final index value.*

An example will demonstrate this concept.

Example: As in the preceding example, suppose that the striking price of the structured product is 1,100 and the adjustment factor is 8.75%. At what price would the final cash settlement value be something *greater* than the base value of 10? That price can be solved for with the following simple equation:

Break-even final index value = Striking price / (1 – Adjustment factor)
= 1,100 / (0.9125) = 1,205.48.

Generally speaking, the underlying index must increase in value by a specific amount just to break even. In this case that amount is:

1 / (1 – Adjustment factor) = 1 / 0.9175 = 1.0959

In other words, the underlying index must increase in value by more than 9.5% by maturity just to overcome the weight of the adjustment factor. If the index increases by a lesser amount, then the structured product holder will merely receive back his base value (10) at maturity.

The previous examples all show that the adjustment factor is not a trivial thing. At first glance, one might not realize just how burdensome it is. After all, one might

ask himself, what does 1.25% per year really matter? However, you can see that it *does* matter. In fact, our above examples did not even factor in the other cost that any investor has when his money is at risk – the cost of carry, or what he could have made had he just put the money in the bank.

MEASURING THE COST OF THE ADJUSTMENT FACTOR

The magnitude of the adjustment increases as the price of the underlying increases. It is an unusual concept. We know that the structured product initially had an imbedded call option. Earlier in this chapter, we endeavored to price that option. However, with the introduction of the concept of an adjustment factor, it turns out that the call option's cost is not a fixed amount. It varies, depending on the *final value* of the underlying index. In fact, the cost of the option is a percentage of the final value of the index. Thus, we can't really price it at the beginning, because we don't know what the final value of the index will be. In fact, we have to cease thinking of this option's cost as a fixed number. Rather, it is a geometric cost, if you will, for it increases as the underlying does.

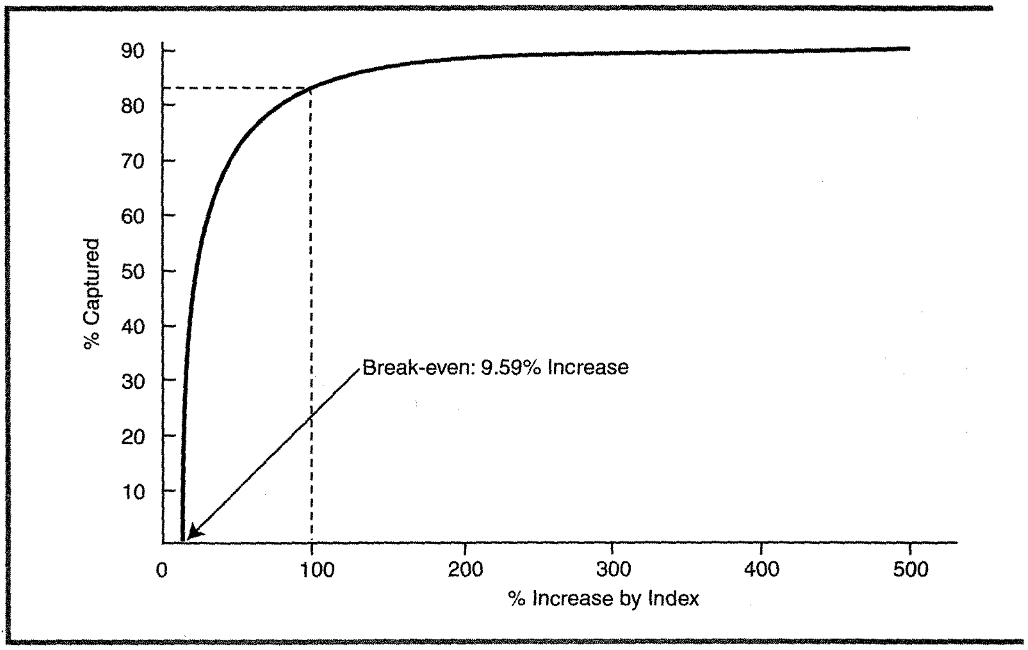
Perhaps another way to think of this is to visualize what the cost will be in percentage terms. Figure 32-2 compares how much of the percent increase in the index is captured by the structured product in the preceding example. The x-axis on the graph is the percent increase by the index. The y-axis is the percent realized by the structured product. The terms are the same as used in the previous examples: The strike price is 1,100, the total adjustment factor is 8.75%, and the guarantee price of the structured product is 10.

The dashed line illustrates the first example that was shown, when a doubling of the index value (an increase of 100%) to 2,200 resulted in a gain of 83.5% in the price of the structured. Thus, the point (100%, 83.5%) is on the line on the chart where the dashed lines meet.

Figure 32-2 points out just how little of the percent increase one captures if the underlying index increases only modestly during the life of the structured product. We already know that the index has to increase by 9.59% just to get to the break-even final price. That point is where the curved line meets the x-axis in Figure 32-2.

The curved line in Figure 32-2 increases rapidly above the break-even price, and then begins to flatten out as the index appreciation reaches 100% or so. This depicts the fact that, for small percentage increases in the index, the 8.75% adjustment factor – which is a flat-out downward adjustment in the index price – robs one of most of the percentage gain. It is only when the index has doubled in price or so that the curve stops rising so quickly. In other words, the index has increased enough in value that the structured product, while not capturing *all* of the percentage gain by any means, is now capturing a great deal of it.

FIGURE 32-2.
Percent of increase captured by structured product.

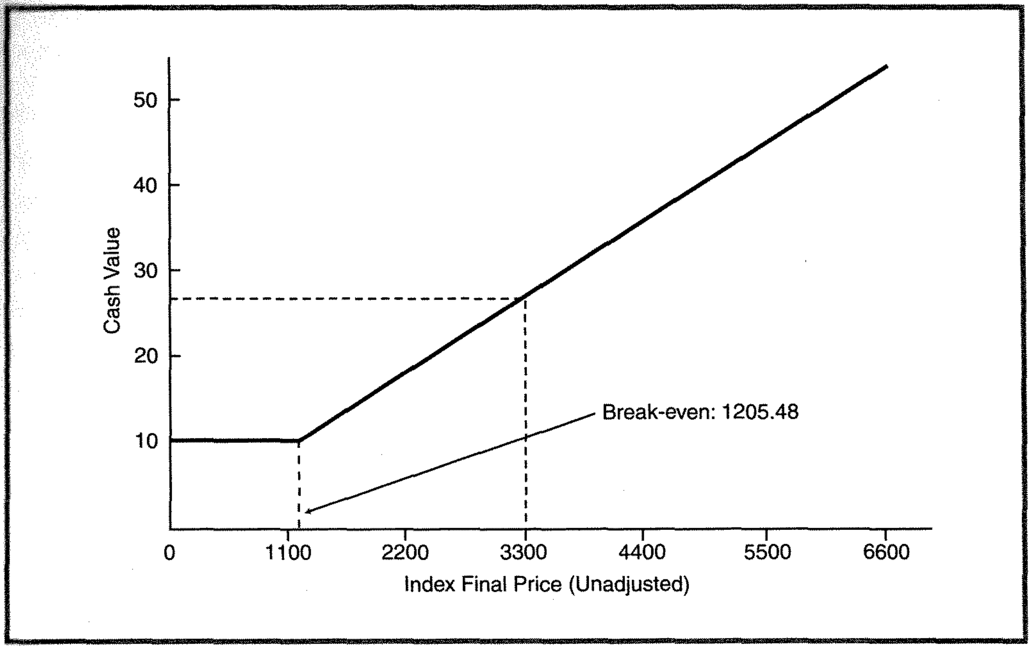


After that, the curve in Figure 32-2 flattens dramatically. It eventually flattens out completely at 91.25%. That is, if the index increases enough in value (about 3,000% or more!), then the structured product final cash value will reflect the full 91.25% percent of appreciation of the index itself. That kind of increase in seven years is virtually unattainable. In reality, the index – if it increases at all – will probably be more in line with the values shown on the x-axis in Figure 32-2. In those cases, especially for increases of 100% or less, the oppressive weight of the adjustment factor significantly harms the return from the structured product.

One could visualize the graph in Figure 32-2 another way, if it would help. Replace the values on the x-axis with the actual index values: 2,200, 3,300, 4,400, 5,500, and 6,600 would replace the figures shown as 100, 200, 300, 400, and 500. Thus, the x-axis could then represent the final value of the index (before adjustment). That might help to relate just how far the index would have to rise in order to overcome the downward adjustment.

Figure 32-3 shows a more conventional look at the comparison between the index value at maturity and the cash value of the structured product. For example, the dashed line shows that, with the final value (unadjusted) of the index at 3,300, the structured product's final cash value would be 27.375, as shown in a prior example. The line on Figure 32-3 looks like that of owning a call – limited risk, with large

FIGURE 32-3.
Cash value of structured product at maturity.



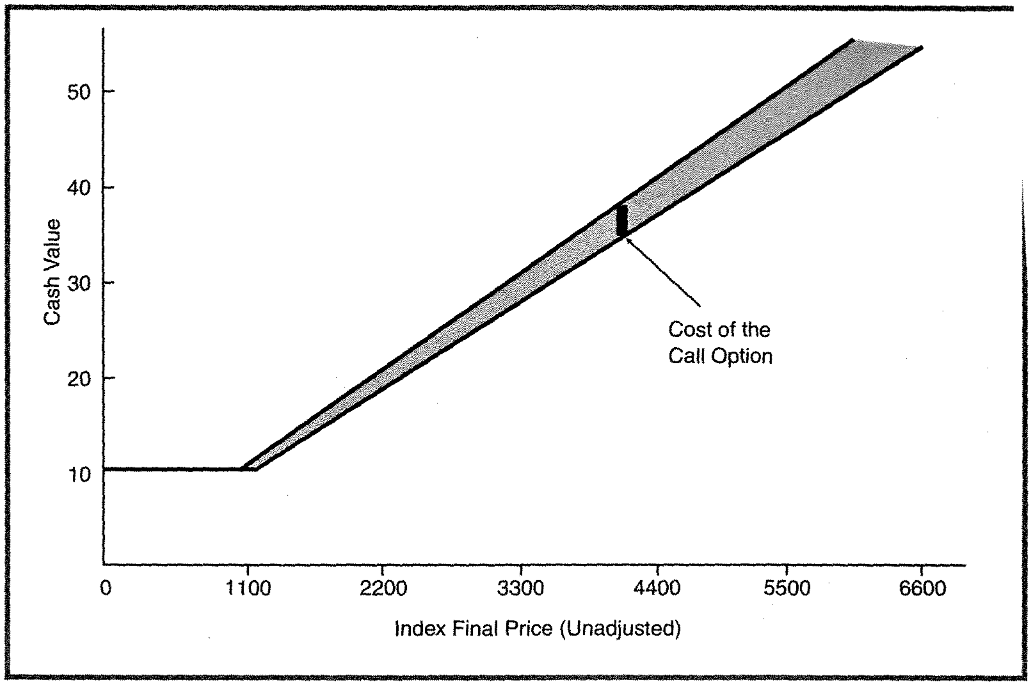
upside profit potential. It is much more difficult to tell that the adjustment factor is weighing down the value of the structured product so dramatically from this chart. Both Figures 32-2 and 32-3 are mathematically correct. However, only Figure 32-2 depicts the real cost of owning a structured product with an adjustment factor.

The final graph on this topic, Figure 32-4, shows the cash value of the adjusted structured product (the same line as was shown in Figure 32-3), compared with an unadjusted line. For example, the unadjusted line shows a true doubling of the price of the structured product if the underlying index has doubled. The difference between the two lines (the shaded area) can be thought of as the cost of the imbedded call – or at least as the cost of the adjustment factor. You can see from Figure 32-4 how the call's "cost" increases as the value of the underlying index increases.

OTHER CONSTRUCTS

The financial engineers who create structured products have come up with a number of different constructs over time. Some resemble spreads, and some have two or three different products bundled into one. In fact, just about anything is possible. All that is required is that the underwriter thinks there is enough interest somewhere for him to be able to create the product, mark it up, and sell it to whomever has inter-

FIGURE 32-4.
Comparison of adjusted and unadjusted cash values at maturity.



est. In this section, a couple of different constructs, ones that have been brought to the public marketplace in the past, are discussed.

THE BULL SPREAD

Several structured products have represented a bull spread, in effect. In some cases, the structured product terms are stated just like those of a call spread in that the final cash value is defined with both a minimum and a maximum value. For example, it might be described something like this:

"The final cash value of the (structured) product is equal to a minimum of a base price of 10, plus any appreciation of the underlying index above the striking price, subject to a maximum price of 20" (where the striking price is stated elsewhere).

It's fairly simple to see how this resembles a bull spread: The worst you can do is to get back your $10, which is presumably the initial offering price, just as in any of the structured products described previously in this chapter. Then, above that, you'd get some appreciation of the index price above the stated striking price – again

like the products discussed earlier. However, in this case, there is a maximum that the cash value can be worth: 20. In other words, there is a *ceiling* on the value of this structured product at maturity. It is exactly like a bull spread with two striking prices, one at 10 and one at 20. In reality, this structured product would have to be evaluated using *both* striking prices. We'll get to that in a minute.

There is another way that the underwriter sometimes states the terms of the structured product, but it is also a bull spread in effect. The prospectus might say something to the effect that the structured product is defined pretty much in the standard way, but that it is *callable* at a certain (higher) price on a certain date. In other words, someone else can call your structured product away on that date. In effect, you have *sold* a call with a higher striking price against your structured product. Thus, you own an imbedded call via the usual purchase of the structured product and you have written a call with a higher strike. That, again, is the definition of a bull spread.

When analyzing a product such as this, one must be mindful that there are *two* calls to price, not only in determining the final value, but more importantly in determining where you might expect the structured product to trade *during* its life, prior to maturity. An option strategist knows that a bull spread doesn't widen out to its maximum profit potential when there is still a lot of time remaining before expiration, unless the underlying rises by a substantial amount in excess of the higher striking price of the spread. Thus, one would expect this type of structured product to behave in a similar manner.

The example that will be used in the rest of this section is based on actual "bull spread" structured products of this type that trade in the open marketplace.

Example: Suppose that a structured product is linked to the Internet index. The strike price, based on index values, is 150. If the Internet index is below 150 at maturity, seven years hence, then the structured product will be worth a base value of 10. There is no adjustment factor, nor is there a participation rate factor. So far, this is just the same sort of definition that we've seen in the simpler examples presented previously. The final cash value formula would be simply stated as:

$$\text{Final cash value} = 10 \times (\text{Final Internet index value}/150)$$

However, the prospectus also states that this structured product is *callable* at a price of 25 during the last month of its life.

This call feature means that there is, in effect, a cap on the price of the underlying. In actual practice, the call feature may be for a longer or shorter period of time, and may be callable well in advance of maturity. Those factors merely determine the expiration date of the imbedded call that has been "written."

The first thing one should do is to convert the striking price into an equivalent price for the underlying index, so that he can see where the higher striking price is in relation to the index price. In this example, the higher striking price when stated in terms of the structured product is 2.5 times the base price. So the higher striking price, in *index* terms, would be 2.5 times the striking price, or 375:

$$\begin{aligned} \text{Index call price} &= (\text{Call price} / \text{Base price}) \times \text{Striking price} \\ &= (25 / 10) \times 150 \\ &= 375 \end{aligned}$$

Hence, if the Internet index rose above 375, the call feature would be "in effect" (i.e., the written call would be in-the-money). The value at which we can expect the structured product to trade, at maturity, would be equal to the base price plus the value of the bull spread with strikes of 10 and 25.

Valuing the Bull Spread. Just as the single-strike structured products have an imbedded call option in them, whose cost can be inferred, so do double-strike structured products. The same line of analysis leads to the following:

$$\text{"Theoretical" cash value} = 10 + \text{Value of bull spread} - \text{Cost of carry}$$

Cost of carry refers to the cost of carry of the base price (10 in this example).

By using an option model and employing knowledge of bull spreads, one can calculate a theoretical value for the structured product at any time during its life. Moreover, one can decide whether it is cheap or expensive – factors that would lead to a decision as to whether or not to buy.

Example: Suppose that the Internet index is trading at a price of 210. What price can we expect the structured product to be trading at? The answer depends on how much time has passed. Let's assume that two years have passed since the inception of the structured product (so there are still five years of life remaining in the option).

With the Internet index at 210, it is 40% above the structured product's lower striking price of 150. Thus, the equivalent price for the structured product would be 14. Another way to compute this would be to use the cash value formula:

$$\text{Cash value} = 10 \times (210 / 150) = 14$$

Now, we could use the Black–Scholes (or some other) model to evaluate the two calls – one with a striking price of 10 and the other with a striking price of 25. Using a volatility estimate of 50%, and assuming the underlying is at 14, the two calls are roughly valued as follows:

Underlying price: 14

Option	Theoretical Price
5-year call, strike = 10	7.30
5-year call, strike = 25	3.70

Thus, the value of the bull spread would be approximately 3.60 (7.30 minus 3.70). The structured product would then be worth 13.60 – the base price of 10, plus the value of the spread:

"Theoretical" cash value = 10 + 3.60 – Cost of carry = 13.60 – Cost of carry

It may seem strange to say that the value of the structured product is actually less than the cash value, but that is what the call feature does: It reduces the worth of the structured product to values *below* what the cash value formula would indicate.

Given this information, we can predict where the structured product would trade at any price or at any time prior to maturity. Let's look at a more extreme example, then, one in which the Internet index has a tremendously big run to the upside.

Example: Suppose that the Internet index has risen to 525 with four years of life remaining until maturity of the structured product. This is well above the index-equivalent call price of 375. Again, it is first necessary to translate the index price back to an equivalent price of the structured product, using either percentage gains or the cash value formula:

$$\text{Cash value} = 10 \times (525/\ 150) = 35$$

Again, using the Black–Scholes model, we can determine the following theoretical values:

Underlying price: 35

Option	Theoretical Price
3-year call, strike = 10	25.50
3-year call, strike = 25	14.70

Now, the value of the bull spread is 10.80 (25.50 minus 14.70). The deepest in-the-money option is trading near parity, but the (written) option is only 10 points in-the-money and thus has quite a bit of time value premium remaining, since there are three years of life left:

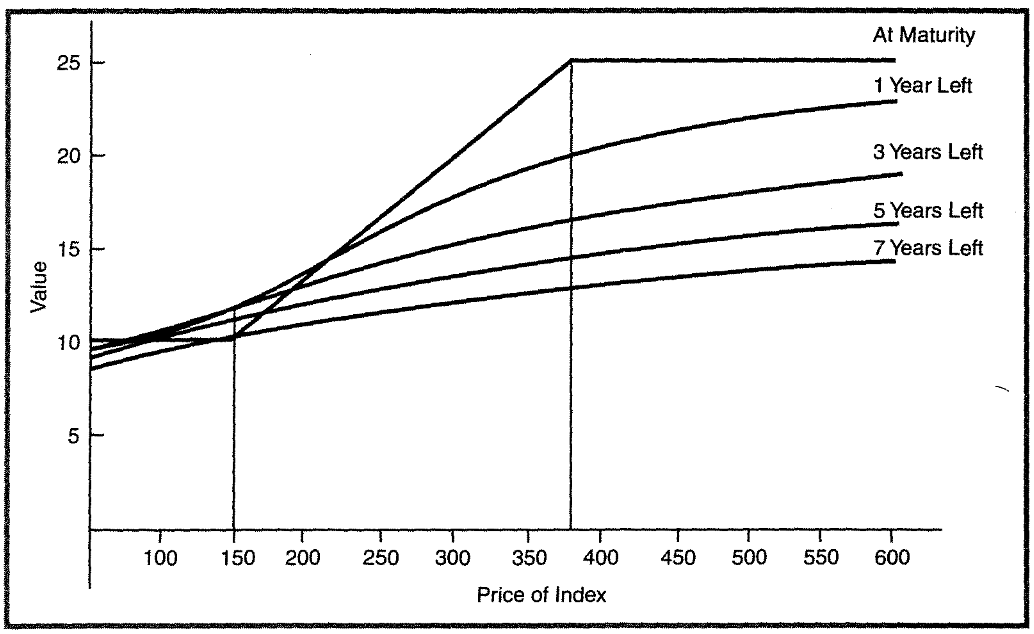
"Theoretical" cash value = 10 + 10.80 = 20.80 – Cost of carry

Hence, even though the Internet index is at 525 – far above the equivalent cal price of 375 – the structured product is expected to be trading at a price well belov its maximum price of 25.

Figure 32-5 shows the values over a broad spectrum of prices and for various expiration dates. One can clearly see that the structured product will not trade near its maximum price of 25 until time shrinks to nearly the maturity date, or until the underlying index rises to very high prices. In particular, note where the theoretical values for the bull spread product lie when the index is at the higher striking price of 375 (there is a vertical line on the chart to aid in identifying those values). The structured product is not worth 20 in any of the cases, and for longer times to maturity, it isn't even worth 15. Thus, the call feature tends to dampen the upside profit potential of this product in a dramatic manner.

The curves in Figure 32-5 were drawn with the assumption that volatility is 50%. Should volatility change materially during the life of the structured product, then the values would change as well. A *lower* volatility would push the curves *up* toward the "at maturity" line, while an *increase* in volatility would push the curves down even further.

FIGURE 32-5.
Value of bull spread structured product.



MULTIPLE EXPIRATION DATES

In some cases, more than one expiration date is involved when the structured product is issued. These products are very similar to the simple ones first discussed in this chapter. However, rather than maturing on a specific date, the final index value – which is used to determine the final cash value of the structured product – is the average of the underlying index price on two or three different dates.

For example, one such listed product was issued in 1996 and used the S&P 500 index ($SPX) as the underlying index. The strike price was the price of $SPX on the day of issuance, as usual. However, there were three maturity dates: one each in April 2001, August 2002, and December 2003. The final index value used to determine the cash settlement value was specified as the average of the $SPX closings on the three maturity dates.

In effect, this structured product was really the sum of three separate structured products, each maturing on a different date. Hence, the values of the imbedded calls could each be calculated separately, using the methods presented earlier. Then those three values could be averaged to determine the overall value of the imbedded call in this structured product.

OPTION STRATEGIES INVOLVING STRUCTURED PRODUCTS

Since the structured products described previously are similar to well-known option strategies (long call, bull spread, etc.), it is possible to use listed options in conjunction with the structured products to produce other strategies. These strategies are actually quite simple and would follow the same lines as adjustment strategies discussed in the earlier chapters of this book.

Example: Assume that an investor purchased 15,000 shares of a structured product some time ago. It is essentially a call option on the S&P 500 index ($SPX). The product was issued at a price of 10, and that is the guarantee price as well. The striking price is 700, which is where $SPX was trading at the time. However, now $SPX is trading at 1,200, well above the striking price. The cash value of the product is:

$$10 \times (1{,}200 / 700) = 17.14$$

Furthermore, assume that there are still two years remaining until maturity of the structured product, and the investor is getting a little nervous about the market. He is thinking of selling or hedging his holding in the structured product. However, the structured product itself is trading at 16.50, a discount of 64 cents from its theo-

retical cash value. He is not too eager to sell at such a discount, but he realizes tha he has a lot of exposure between the current price and the guarantee price of 10.

He might consider writing a listed call against his position. That would conver it into the equivalent of a bull spread, since he already holds the equivalent of a long call via ownership of the structured product. Suppose that he quotes the $SPX options that trade on the CBOE and finds the following prices for 6-month options expiring in December:

$SPX: 1,200

Option	Price
December 1,200 call	85
December 1,250 call	62
December 1,300 call	43

Suppose that he likes the sale of the December 1,250 call for 62 points. How many should he sell against his position in order to have a proper hedge?

First, one must compute a *multiplier* that indicates how many shares of the structured product are equivalent to one "share" of the $SPX. That is done in the simple case by dividing the striking price by the guarantee price:

Multiplier = Striking price / Base price
= 700 / 10 = 70

This means that buying 70 shares of the structured product is equivalent to being long one share of $SPX. To verify this, suppose that one had bought 70 shares of the structured product initially at a price of 10, when $SPX was at 700. Later, assume that $SPX doubles to 1,400. With the simple structure of this product, which has a 100% participation rate and no adjustment factor, it should also double to 20. So 70 shares bought at 10 and sold at 20 would produce a profit of $700. As for $SPX, one "share" bought at 700 and later sold at 1,400 would also yield a profit of $700. This verifies that the 70-to-1 ratio is the correct multiplier.

This multiplier can then be used to figure out the current equivalent structured product position in terms of $SPX. Recall that the investor had bought 15,000 shares initially. Since the multiplier is 70-to-1, these 15,000 shares are equivalent to:

$SPX equivalent shares = Shares of structured product held / Multiplier
= 15,000 / 70 = 214.29

That is, owning this structured product is the equivalent of owning 214+ shares of $SPX at current prices. Since an $SPX call option is an option on 100 "shares" of $SPX, one would write 2 calls (rounding off) against his structured profit position. Since the SPX December 1,250 calls are selling for 62, that would bring in $12,400 less commissions.

Note that the sale of these calls effectively puts a cap on the profit potential of the investor's overall position until the December expiration of the listed calls. If $SPX were to rise substantially above 1,250, his profits would be "capped" because the two calls were sold. Thus, he has effectively taken his synthetic long call position and converted it into a bull spread (or a collared index fund, if you prefer that description).

In reality, *any* calls written against the structured product would have to be margined as naked calls. In a virtual sense, the 15,000 shares of the structured product "cover" the sale of 2 $SPX calls, but margin rules don't allow for that distinction. In essence, the sale of two calls would create a bull spread. Alternatively, if one thinks of the structured product as a long index fully protected by a put (which is another way to consider it), then the sale of the $SPX listed call produces a "collar."

Of course, one could write *more* than two $SPX calls, if he had the required margin in his account. This would create the equivalent of a call ratio spread, and would have the properties of that strategy: greatest profit potential at the striking price of the written calls, limited downside profit potential, and theoretically unlimited upside risk if $SPX should rise quickly and by a large amount.

In any of these option writing strategies, one might want to write out-of-the-money, short-term calls against his structured product periodically or continuously. Such a strategy would produce good results if the underlying index does not advance quickly while the written calls are in place. However, if the index should rise through the striking price of the written calls, such a strategy would detract from the overall return of the structured product.

Changing the Striking Price. Another strategy that the investor could use if he so desired is to establish a vertical call spread in order to effectively change the striking price of the (imbedded) call. For example, if the market had advanced by a great deal since the product was bought, the imbedded call would theoretically have a nice profit. If one could sell it and buy another, similar call at a higher strike, he would effectively be rolling his call up. This would raise the striking price and would reduce downside risk greatly (at the cost of slightly reducing upside profit potential).

Example: Using the same product as in the previous example, suppose that the investor who owns the structured product considers another alternative. In the previous example, he evaluated the possibility of selling a slightly out-of-the-money listed call to effectively produce a collared position, or a bull spread. The problem with that is that it limits upside profit potential. If the market were to continue to rise, he would only participate up to the higher strike (plus the premium received).

A better alternative might be to roll his imbedded call up, thereby taking so money out of the position but still retaining upside profit potential. Recall that t structured product had these terms:

Guarantee price: 10
Underlying index: S&P 500 index ($SPX)
Striking price: 700

As in the earlier example, the investor owns 15,000 shares of the structur product. Furthermore, assume that there are about two years remaining until mat rity of the structured product, and that the current prices are the same as in the pr vious example:

Current price of structured product: 16.50
Current price of $SPX: 1,200

For purposes of simplicity, let's assume that there are listed two-year LEAP options available for the S&P index, whose prices are:

S&P 2-year LEAPS, striking price 700:	550
S&P 2-year LEAPS, striking price 1,200:	210

In reality, S&P LEAPS options are normally reduced-value options, meanin that they are for one-tenth the value of the index and thus sell for one-tenth the price However, for the purposes of this theoretical example, we will assume that the full value LEAPS shown here exist.

It was shown in the previous example that the investor would trade *two* of these calls as an equivalent amount to the quantity of calls imbedded in his structured product. So, this investor could *buy* two of the 1,200 calls and *sell* two of the 700 call and thereby roll his striking price up from 700 to 1,200. This roll would bring in 34(points, two times; or $68,000 less commissions.

Since the difference in the striking prices is 500 points, you can see that he is leaving something "on the table" by receiving only 340 points for the roll-up. This is common when rolling up: One loses the time value premium of the vertical spread. However, when viewed from the perspective of what has been accomplished, the investor might still find this roll worthwhile. He has now raised the striking price of his call to 1,200, based on the S&P index, and has taken in $68,000 in doing so. Since he owns 15,000 shares of the structured product, that means he has taken in 4.53 per share (68,000 / 15,000). Now, for example, if the S&P crashes during the next two years and plummets below 700 at the maturity date, he will receive $10 as the guarantee price plus the $4.53 he got from the roll – a total "guarantee" of $14.53. Thus, he has protected his downside.

Note that his downside risk is not completely eliminated, though. The current price of the structured product is 16.50 and the cash value at the current S&P price is 17.14 (see the previous example for this calculation), so he has risk from these levels down to a price of $14.53.

His upside is still unlimited, because he is net long two calls – the S&P 2-year LEAPS calls, struck at 1,200. The two LEAPS calls that he sold, struck at 700, effectively offsets the call imbedded in the structured product, which is also struck at 700.

This example showed how one could effectively roll the striking price of his structured product up to a higher price after the underlying had advanced. The individual investor would have to decide if the extra downside protection acquired is worth the profit potential sacrificed. That depends heavily, of course, on the prices of the listed S&P options, which in turn depend on things such as volatility and time remaining until expiration.

Of course, one other alternative exists for a holder of a structured product who has built up a good profit, as in the previous two examples: He could sell the product he owns and buy another one with a striking price closer to the current market value of the underlying index. This is not always possible, of course, but as long as these products continue to be brought to market every few months or so by the underwriters, there will be a wide variety of striking prices to choose from. A possible drawback to rolling to another structured product is that one might have to extend his holding's maturity date, but that is not necessarily a bad thing.

A different scenario exists when the underlying index *drops* after the structured product is bought. In that case, one would own a synthetic call option that might be quite far *out-of-the-money.* A listed call spread could be used to theoretically lower the call's striking price, so that upside movement might more readily produce profits. In such a case, one would sell a listed call option with a striking price equal to the striking price of the structured product and would buy a listed call option with a lower striking price – one more in line with current market values. In other words, he would buy a listed call bull spread to go along with his structured product. Whatever debit he pays for this call bull spread will increase his downside risk, of course. However, in return he gains the ability to make profits more quickly if the underlying index rises above the new, lower striking price.

Many other strategies involving listed options and the structured product could be constructed, of course. However, the ones presented here are the primary strategies that an investor should consider. All that is required to analyze any strategy is to remember that this type of structured product is merely a synthetic long call. Once that concept is in mind, then any ensuing strategies involving listed options can easily be analyzed. For example, the purchase of a listed put with a striking price essential-

ly equal to that of the structured product would produce a position similar to a lo straddle. The reader is left to interpret and analyze other such strategies on his ow

LISTS OF STRUCTURED PRODUCTS

The descriptions provided so far encompass the great majority of listed structure products. There are many similar ones involving individual stocks instead of indice (often called equity-linked notes). The concepts are the same; merely substitute stock price for an index price in the previous discussions in this chapter.

Some large insurance companies offer similar products in the form of annuities They behave in exactly the same way as the products described above, except tha there is no continuous market for them. However, they still afford one the opportunity to own an index fund with no risk. Many of the insurance company products, in fact, pay interest to the annuity holder – something that most of the products listed on the stock exchanges do not.

Both the CBOE and American Exchange Web sites (www.cboe.com and www.amex.com) contain details of the structured products listed on their respective exchanges. A sampling at the time of this writing showed the following breakdowns of listed structured products:

Underlying Index	Percent of Listed Products
Broad-based index (S&P 500, e.g.)	23%
Sector index	43%
Stocks	34%

If you browse those lists, an investor may find indices or stocks that are of particular interest to him. In addition, it may be possible to find ones trading at a substantial discount to cash settlement value, something a strategist might find attractive.

Part II: Products Designed to Provide "Income"

PERCS

At the beginning of this chapter, it was stated that most listed structured products fall into one of two categories. The first category was the type of structured product that resembled the ownership of a call option. The second portion, to be dis-

cussed in the remainder of this chapter, resembles the covered write of a call option. These often have names involving the term *preferreds*. Some are called Trust Preferreds; another popular term for them is Preferred Equity Redemption Cumulative Stock (PERCS). We will use the term *PERCS* in the following examples, but the reader should understand that it is being used in a generic sense – that any of the similar types of products could be substituted wherever the term PERCS is used.

A PERCS is a structured product, issued with a maturity date and tied to an individual stock. At the time of issuance, the PERCS and the common stock are usually about the same price. The PERCS pays a higher dividend than the common stock, which may pay no dividend at all. If the underlying common should decline in price, the PERCS should decline by a lesser amount because the higher dividend payout will provide a yield floor, as any preferred stock does.

There is a limited life span with PERCS that is spelled out in the prospectus at the time it is issued. Typically, that life span is about three years. At the end of that time, the PERCS becomes ordinary common stock.

A PERCS may be called at any time by the issuing corporation if the company's common stock exceeds a predetermined call price. In other words, this PERCS stock is callable. The call price is normally higher than the price at which the common is trading when the PERCS is issued.

What one has then, if he owns a PERCS, is a position that will eventually become common stock unless it is called away. In order to compensate him for the fact that it might be called away, the owner receives a higher dividend. What if one substitutes the word "premium" for "higher dividend"? Then the last statement reads: *In order to compensate him for the fact that it might be called away, the owner receives a premium.* This is exactly the definition of a covered call option write. Moreover, it is an out-of-the-money covered write of a long-term call option, since the call price of the PERCS is akin to a striking price and is higher than the initial stock price.

Example: XYZ is selling at $35 per share. XYZ common stock pays $1 a year in dividends. The company decides to issue a PERCS.

The PERCS will have a three-year life and will be callable at $39. Moreover, the PERCS will pay an annual dividend of $2.50.

The PERCS annual dividend rate is 7% as compared to 2.8% for the common stock.

If XYZ were to rise to 39 in exactly three years, the PERCS would be called. The total return that the PERCS holder would have made over that time would be:

Stock price appreciation (39 – 35):	4
Dividends over 3 years:	7.50
Total gain	11.50
Total return:	11.50/35 = 32.9%
Annualized return:	32.9%/3 = 11%

If the PERCS were called at an earlier time, the annualized return might be even higher.

CALL FEATURE

The company will most likely call the PERCS if the common is above the call price for even a short period of time. The prospectus for the PERCS will describe any requirements regarding the call. A typical one might be that the common must close above the call price for five consecutive trading days. If it does, then the company may call the PERCS, although it does not have to. The decision to call or not is strictly the company's. The PERCS holder has no choice in the matter of when or if his shares are called. This is the same situation in which the writer of a covered call finds himself: He cannot control when the exercise will occur, although there are often clues, including the disappearance of time value premium in the written listed call option. The PERCS holder is more in the dark, because he cannot actually see the separate price of the imbedded call within the PERCS. Still, as will be shown later, he may be able to use several clues to determine whether a call is imminent.

Most PERCS may be called for either cash or common stock. This does not change the profitability from the strategist's standpoint. He either receives cash in the amount of the call price, or the same dollar amount of common stock. The only difference between the two is that, in order to completely close his position, he would have to sell out any common stock received via the call feature. If he had received cash instead, he wouldn't have to bother with this final stock transaction.

In the case of most PERCS, the call feature is more complicated than that presented in the preceding example. Recall that the company that issued the PERCS can call it at any time during the three years, as long as the common is above the call price. The holder of the XYZ PERCS in the example would not be pleased to find that the PERCS was called before he had received any of the higher dividends that the PERCS pays. Therefore, in order to give a PERCS holder essentially the same return no matter when the PERCS is called, there is a "sliding scale" of call prices.

At issuance, the call price will be the highest. Then it will drop to a slightly lower level after some of the dividends have been paid (perhaps after the first year).

This lowering of the call price continues as more dividends are paid, until it finally reaches the final call price at maturity. The PERCS holder should not be confused by this sliding scale of call prices. *The sliding call feature is designed to ensure that the PERCS holder is compensated for not receiving all his "promised" dividends if the PERCS should be called prior to maturity.*

Example: As before, XYZ issues a PERCS when the common is at 35. The PERCS pays an annual dividend of \$2.50 per share as compared to \$1 per share on the common stock. The PERCS has a final call price of 39 dollars per share in three years.

If XYZ stock should undergo a sudden price advance and rise dramatically in a very short period of time, it is possible that the PERCS could be called before any dividends are paid at all. In order to compensate the PERCS holder for such an occurrence, the *initial call price* would be set at 43.50 per share. That is, the PERCS can't be called unless XYZ trades to a price over 43.50 dollars per share. Notice that the difference between the eventual call price of 39 and the initial call price of 43.50 is 4.50 points, which is also the amount of additional dividends that the PERCS would pay over the three-year period. The PERCS pays \$2.50 per year and the common \$1 per year, so the difference is \$1.50 per year, or \$4.50 over three years.

Once the PERCS dividends begin to be paid, the call price will be reduced to reflect that fact. For example, after one year, the call price would be 42, reflecting the fact that if the PERCS were not called until a year had passed, the PERCS holder would be losing \$3 of additional dividends as compared to the common stock (\$1.50 per year for the remaining two years). Thus, the call price after one year is set at the eventual call price, 39, plus the \$3 of potential dividend loss, for a total call price of 42.

This example shows how the company uses the sliding call price to compensate the PERCS holder for potential dividend loss if the PERCS is called before the three-year time to maturity has elapsed. Thus, the PERCS holder will make the same dollars of profit – dividends and price appreciation combined – no matter when the PERCS is called. In the case of the XYZ PERCS in the example, that total dollar profit is \$11.50 (see the prior example). Notice that the investor's annualized rate of return would be much higher if he were called prior to the eventual maturity date.

One final point: The call price slides on a scale as set forth in the prospectus for the PERCS. It may be every time a dividend is paid, but more likely it will be daily! That is, the present worth of the remaining dividends is added to the final call price to calculate the sliding call price daily. Do not be overwhelmed by this feature. Remember that it is just a means of giving the PERCS holder his entire "dividend premium" if the PERCS is called before maturity.

For the remainder of this chapter, the call price of the PERCS will be referred to as the redemption price. Since much of the rest of this chapter will be concerned with discussing the fact that a PERCS is related to a call option, there could be some confusion when the word *call* is used. In some cases, call could refer to the price at which the PERCS can be called; in other cases, it could refer to a call option – either a listed one or one that is imbedded within the PERCS. Hence, the word *redemption* will be used to refer to the action and price at which the issuing company may call the PERCS.

A PERCS IS A COVERED CALL WRITE

It was stated earlier that a PERCS is like a covered write. However, that has not yet been proven. It is known that any two strategies are equivalent if they have the same profit potential. Thus, if one can show that the profitability of owning a PERCS is the same as that of having established a covered call write, then one can conclude that they are equivalent.

Example: For the purposes of this example, suppose that there is a three-year listed call option with striking price 39 available to be sold on XYZ common stock. Also, assume that there is a PERCS on XYZ that has a redemption price of 39 in three years. The following prices exist:

XYZ common: 35
XYZ PERCS: 35
3-year call on XYZ common with striking price of 39: 4.50

First, examine the XYZ covered call write's profitability from buying 100 XYZ and selling one call. It was initially established at a debit of 30.50 (35 less the 4.50 received from the call sale). The common pays $1 per year in dividends, for a total of $3 over the life of the position.

XYZ Price in 3 Years	Price of a 3-Year Call	Profit/Loss on Securities	Total Profit/Loss Incl. Dividend
25	0	–$550	–$250
30	0	–50	+250
35	0	+450	+750
39	0	+850	+1,150
45	6	+850	+1,150
50	11	+850	+1,150

This is the typical picture of the total return from a covered write – potential losses on the downside with profit potential limited above the striking price of the written call.

Now look at the profitability of buying the PERCS at 35 and holding it for three years. (Assume that it is not called prior to maturity.) The PERCS holder will earn a total of $750 in dividends over that time period.

XYZ Price in 3 Years	Profit/Loss on PERCS	Total Profit/Loss Incl. Dividend
25	–$1,000	–$250
30	–500	+250
35	0	+750
>=39	+400	+1,150

This is exactly the same profitability as the covered call write. *Therefore, it can be concluded with certainty that a PERCS is equivalent to a covered call write.* Note that the PERCS potential early redemption feature does not change the truth of this statement. The early redemption possibility merely allows the PERCS holder to receive the same total dollars at an earlier point in time if the PERCS is demanded prior to maturity. The covered call writer could theoretically be facing a similar situation if the written call option were assigned before expiration: He would make the same total profit, but he would realize it in a shorter period of time.

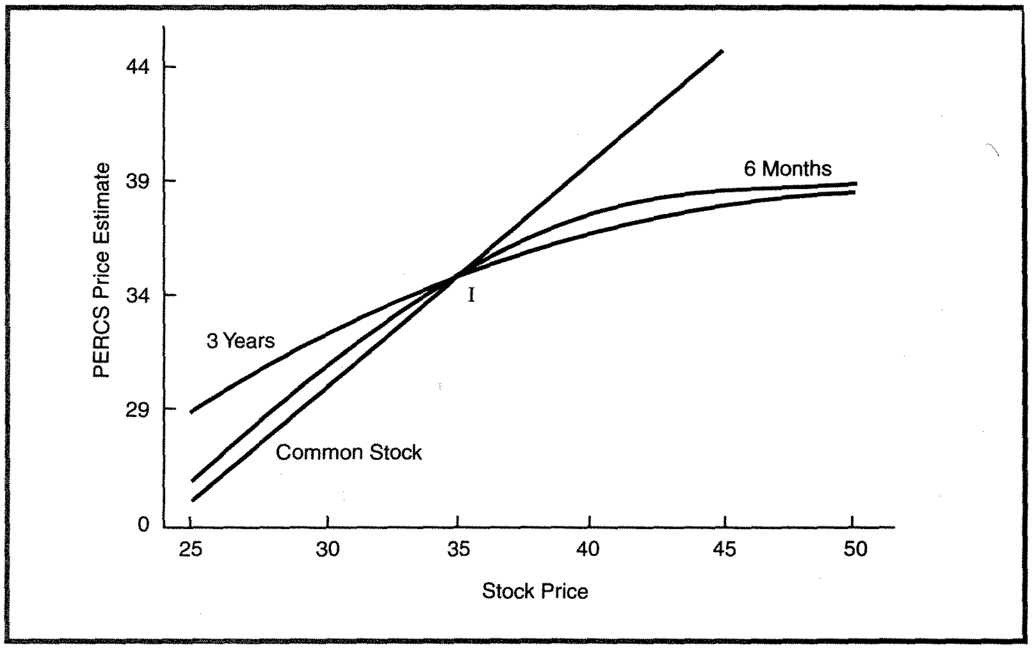
The PERCS is like a covered write of a call option with striking price equal to the redemption price of the PERCS, except that the holder does not receive a call option premium, but rather receives additional dividends. In essence, the PERCS has a call option imbedded within it. The value of the imbedded call is really the value of the additional dividends to be paid between the current date and maturity.

The buyer of a PERCS is, in effect, selling a call option and buying common stock. He should have some idea of whether or not he is selling the option at a reasonably fair price. The next section of this chapter addresses the problem of valuing the call option that is imbedded in the PERCS.

PRICE BEHAVIOR

The way that a PERCS price is often discussed is in relationship to the common stock. One may hear that the PERCS is trading at the same price as the common or at a premium or discount to the common. As an option strategist who understands covered call writing, it should be a simple matter to picture how the PERCS price will relate to the common price.

FIGURE 32-6.
PERCS price estimate versus common stock.



First, consider the out-of-the-money situation. *If the underlying common declines in price, the PERCS will not decline as fast* because the additional dividends will provide yield support. The PERCS will therefore trade at a higher price than the common. However, as the maturity date nears and the remaining number of additional dividends dwindles to a small amount, then the PERCS price and the common price will converge.

The opposite effect occurs if the underlying common moves higher. *The PERCS will trade at a lower price than the common when the common trades above the issue price.* In fact, since there is a redemption price on the PERCS, it will not trade higher than the redemption price. The common, however, has no such restriction, so it could continue to trade at prices significantly higher than the PERCS does.

These points are illustrated in Figure 32-6, which contains the price curves of two PERCS: one at issuance, thus having three years remaining, and the other with just six months remaining until the maturity of the PERCS. For purposes of comparison, it was assumed that there is no sliding redemption feature involved. Several significant points can be made from the figure. First, notice that the PERCS and the common tend to sell at approximately the same price at the point labeled "I." This would be the price at which the PERCS are issued. This issue price must be below the redemption price of the PERCS. More will be said later about how this price is determined.

Another observation that can be made from the figure is that the PERCS pricing curves level off at the redemption price. They cannot sell for more than that price.

Now look on the left-hand side of the figure. Notice that the more time remaining until maturity, the higher the PERCS will trade above the common stock. This is because of the extra dividends that the PERCS pay. Obviously, the PERCS with three years until maturity has the potential to pay more dividends than the one with three months remaining, so the three-year PERCS will sell for more than the six-month PERCS when the common is below the issue price. Since either PERCS pays more dividends than the common, they both trade for higher prices than the common.

When the common trades above the issue price (point "I"), the opposite is true. The six-month PERCS trades for a slightly higher price than the three-year PERCS, but both sell for significantly less than the common, which has no limit on its potential price.

One other observation can be made regarding the situation in which the common trades well below the issue price: After the last additional dividend has been paid by the PERCS, it will trade for approximately the same price as the common in that situation.

Viewed strictly as a security, a PERCS may not appear all that attractive to some investors. It has much, but not all, of the downside risk of the common stock, and not nearly the upside potential. It does provide a better dividend, however, so if the common is relatively unchanged from the issue price when the PERCS matures, the PERCS holder will have come out ahead. If this description of the PERCS does not appeal to you, then neither should covered call writing, for it is the same strategy; a call option premium is merely substituted for the higher dividend payout.

PERCS STRATEGIES

Since the PERCS is equivalent to a covered write, strategies that have covered writes as part of their makeup are amenable to having PERCS as part of their makeup as well. Covered writing is part of ratio writing. Other modifications to the covered writing strategy itself, such as the protected covered write, can also be applied to the PERCS.

PROTECTING THE PERCS WITH LISTED OPTIONS

The safest way to protect the PERCS holding with listed options is to buy an out-of-the-money put. The resultant position – long PERCS and long put – is a protected covered write, or a "collar." The long put prevents large losses on the downside, but it costs the PERCS holder something. He won't make as much from his extra dividend payout, because he is spending money for the listed put. Still, he may want the downside comfort.

Once one realizes that a PERCS is equivalent to a covered write, he can easily extend that equivalence to other positions as well. For example, it is known that a covered call write is equivalent to the sale of a naked put. Thus, *owning a PERCS is equivalent to the sale of a naked put.* Obviously, the easiest way to hedge a naked put is to buy another put, preferably out-of-the-money, as protection.

Do not be deluded into thinking that selling a listed call against the PERCS is a safe way of hedging. Such a call option sale does add a modicum of downside protection, but it exposes the upside to large losses and therefore introduces a potential risk into the position. It is really a ratio write. The subject is covered later in this chapter.

REMOVING THE REDEMPTION FEATURE

At issuance, the imbedded call is a three-year call, so it is not possible to exactly duplicate the PERCS strategy in the listed market. However, as the PERCS nears maturity, there will be listed calls that closely approximate the call that is imbedded in the PERCS. Consequently, one may be able to use the listed call or the underlying stock to his advantage.

If one were to buy a listed call with features similar to the imbedded call in a PERCS that he owned, he would essentially be creating long common stock. Not that one would necessarily need to go to all that trouble to create long common stock, but it might provide opportunities for arbitrageurs.

In addition, it might appeal to the PERCS holder if the common stock has declined and the imbedded call is now inexpensive. If one covers the equivalent of the imbedded call in the listed market, he would be able to more fully participate in upside participation if the common were to rally later. This is not always a profitable strategy, however. It may be better to just sell out the PERCS and buy the common if one expects a large rally.

Example: XYZ issued a PERCS some time ago. It has a redemption price of 39; the common pays a dividend of $1 per year, while the PERCS pays $2.50 per year.

XYZ has fallen to a price of 30 and the PERCS holder thinks a rally may be imminent. He knows that the imbedded call in the PERCS must be relatively inexpensive, since it is 9 points out-of-the-money (the PERCS is redeemable at 39, while the common is currently 30). If he could buy back this call, he could participate more fully in the upward potential of the stock.

Suppose that there is a one-year LEAPS call on XYZ with a striking price of 40. If one were to buy that call, he would essentially be removing the redemption feature from his PERCS.

Assume the following prices exist:

XYZ Common: 30
XYZ PERCS: 31
XYZ January 40 LEAPS call: 2

If one buys this LEAPS call and holds it until maturity of the PERCS one year from now, the profit picture of the long PERCS plus long call position will be the following:

XYZ Price in January Next Year	PERCS Price	January 40 LEAPS	Total Value of Long PERCS + Long LEAPS
25	25	0	25
30	30	0	30
35	35	0	35
40	39	0	39
45	39	5	44
50	39	10	49

Thus, the PERCS + long call position is worth almost exactly what the common stock is after one year. The PERCS holder has regained his upside profit potential.

What did it cost the investor to reacquire his upside? He paid out 2 points for the call, thereby more than negating his $1.50 dividend advantage over the course of the year (the common pays a $1 dividend; the PERCS $2.50). Thus, it may not actually be worth the bother. In fact, notice that if the PERCS holder really wanted to reacquire his upside profit potential, he would have been better off selling his PERCS at 31 and buying the common at 30. If he had done this, he would have taken in 1 point from the sale and purchase, which is slightly smaller than the $1.50 dividend he is forsaking. In either case, he must relinquish his dividend advantage and then some in order to reacquire his upside profit potential. This seems fair, however, for there must be some cost involved with reacquiring the upside.

Remember that an arbitrageur might be able to find a trade involving these situations. He could buy a PERCS, sell the common short, and buy a listed call. If there were price discrepancies, he could profit. It is actions such as these that are required to keep prices in their proper relationship.

CHANGING THE REDEMPTION PRICE OF THE PERCS

When covered writing was discussed as a strategy, it was shown that the writer may want to buy back the call that was written and sell another one at a different strike.

If the action results in a lower strike, it is known as rolling down; if it results in a hig er strike, it is rolling up.

This rolling action changes the profit potential of the position. If one rolls dow he gets more downside protection, but his upside is even more limited than it pre ously was. Still, if he is worried about the stock falling lower, this may be a prop action to take. Conversely, if the common is rallying, and the covered writer is mo bullish on the stock, he can roll up in order to increase his upside profit potential. (course, by rolling up, he creates more downside risk if the common stock should su denly reverse direction and fall.

The PERCS holder can achieve the same results as the covered writer. He ca effectively roll his redemption price down or up if he so chooses. His reasons fc doing so would be substantially the same as the covered writer's. For example, if th common were dropping in price, the PERCS holder might become worried that hi extra dividend income would not be enough to protect him in the case of furthe decline. Therefore, he would want to take in even more premium in exchange fo allowing himself to be called away at a lower price.

Example: XYZ issued PERCS when both were trading at 35. Now, XYZ has fallen tc 30 with only a year remaining until maturity, and the PERCS holder is nervous abou further declines. He could, of course, merely sell his stock; but suppose that he prefers to keep it and attempt to modify his position to more accurately reflect his attitude about future price movements.

Assume the following prices exist:

XYZ Common: 30
XYZ PERCS: 31
XYZ January 40 call: 2
XYZ January 35 call: 4

If he *buys the January 40 call and sells the January 35 call,* he will have accomplished his purpose. This is the same as selling a call bear spread. As shown in the previous example, buying the January 40 call is essentially the same as removing the redemption feature from the PERCS. Then, selling the January 35 call will reinstate a redemption feature at 35. Thus, the PERCS holder has taken in a premium of 2 points and has lowered the redemption price.

If XYZ is below 35 when the options expire, he will have an extra $200 profit from the option trades. If XYZ rallies and is above 35 at expiration, he will be effectively called away at 37 (the striking price of 35 plus the two points from the roll), instead of at the original demand price of 39. In actual practice, if the January 35 call

were assigned, the trader could then be simultaneously long the PERCS and short the common stock, with a long January 40 call in addition. He would have to unwind these pieces separately, an action that might include exercising the January 40 call (if it were in-the-money at expiration) to cover the short common stock.

The conclusion that can be drawn is that *in order to roll down the redemption feature of a PERCS, one must sell a vertical call spread.* In a similar manner, if he wanted to roll the strike up, he would buy a vertical call spread. Using the same example, one would still buy the January 40 call (this effectively removes the redemption feature of the PERCS) and would then sell a January 45 call in order to raise the redemption price. Thus, *buying a vertical call spread raises the effective redemption price of a PERCS.*

There is nothing magic about this strategy. Covered writers use it all the time. It merely evolves from thinking of a PERCS as a covered write.

SELLING A CALL AGAINST A LONG PERCS IS A RATIO WRITE

It is obvious to the strategist that if one owns a PERCS and also sells a call against it, he does not have a covered write. The PERCS is already a covered write. What he has when he sells another call is a ratio write. His equivalent position is long the common and short two calls.

There is nothing inherently wrong with this, as long as the PERCS holder understands that he has exposed himself to potentially large upside losses by selling the extra call. If the common stock were to rally heavily, the PERCS would stop rising when it reached its redemption price. However, the additional call that was sold would continue to rise in price, possibly inflicting large losses if no defensive action were taken.

The same strategies that apply to ratio writing or straddle writing would have to be used by someone who owns a PERCS and sells a call against it. He could buy common stock if the position were in danger on the upside, or he could roll the call(s) up.

A difference between ordinary ratio writing and selling a listed call option against a PERCS is that the imbedded call in the PERCS may be a very long-term call (up to three years). The listed call probably wouldn't be of that duration. So the ratio writer in this case has two different expiration dates for his options. This does not change the overall strategy, but it does mean that the imbedded long-term call will not diminish much in price due to the passage of time, until the PERCS is nearer maturity.

Neutrality is normally an important consideration for a ratio writer. If one is long a PERCS and short a listed call, he is by definition a ratio writer, so he should

be interested in neutrality. The key to determining one's neutrality, of course, is to use the delta of the option. In the case of the PERCS stock, one would have to use the delta of the imbedded call.

Example: An investor is long 1,000 shares of XYZ PERCS maturing in two years. He thinks XYZ is stuck in a trading range and does not expect much volatility in the near future. Thus, a ratio write appeals to him. How many calls should he sell in order to create a neutral position against his 1,000 shares?

First, he needs to compute the delta of the imbedded option in the PERCS, and therefore the delta of the PERCS itself. *The delta of a PERCS is not 1.00, as is the delta of common stock.*

Assume the XYZ PERCS matures in two years. It is redeemable at 39 at that time. XYZ common is currently trading at 33. The delta of a two-year call with striking price 39 and common stock at 33 can be calculated (the dividends, short-term interest rate, and volatility all play a part). Suppose that the delta of such an option is 0.30. Then the delta of the PERCS can be computed:

$$\begin{aligned}\text{PERCS delta} &= 1.00 - \text{Delta of imbedded call}\\ &= 1.00 - 0.30 = 0.70 \text{ in this example}\end{aligned}$$

Assume the following data is known:

Security	Price	Delta
XYZ Common	33	1.00
XYZ PERCS	34	0.70(!)
XYZ October 40 call	2	0.35

Being long 1,000 PERCS shares is the equivalent of being long 700 shares of common (ESP = 1,000 × 0.70 = 700). In order to properly hedge that ESP with the October 40 call, one would need to sell 20 October 40 calls.

$$\begin{aligned}\text{Quantity to sell} &= \text{ESP of PERCS/ESP of October 40 call}\\ &= 700/(100 \text{ shares per option} \times 0.35)\\ &= 700/35 = 20\end{aligned}$$

Thus, the position – long 1,000 PERCS, short 20 October 40 calls – is a neutral one and it is a ratio write.

One may not want to have such a steep ratio, since the result of this example is the equivalent of being long 1,000 common and short 30 calls in total (10 are imbedded in the long PERCS). Consequently, he could look at other options – perhaps writing in-the-money October calls – that have higher deltas and won't require so many to be sold in order to produce a neutral position.

To remain neutral, one would have to keep computing the deltas of the options, both listed and imbedded, as time passes, because stock movements or the passage of time could change the deltas and therefore affect the neutrality of the position.

HEDGING PERCS WITH COMMON STOCK

Some traders may want to use the common stock to hedge the purchase of PERCS. These would normally be market-makers or block traders who acquire the PERCS in order to provide liquid markets or because they think they are slightly mispriced. The simplest way for these traders to hedge their long PERCS would be with common stock.

This strategy might also apply to an individual who holds PERCS, if he wants to hedge them from a potential price decline but does not actually want to sell them (for tax reasons, perhaps).

In either case, *it is not correct to sell 100 shares of common against each 100 shares of PERCS owned.* That is not a true hedge. In fact, what one accomplishes by doing that is to create a naked call option. A PERCS is a covered write; if one sells 100 shares of common stock from a covered write, he is left with a naked call. This could cause large losses if the common rallies.

Rather, *the proper way to hedge the PERCS with common stock is to calculate the equivalent stock position of the PERCS* and hedge with the calculated amount of common stock. The example showed how to calculate the ESP of the PERCS: One must calculate the delta of the imbedded call option, which may be a long-term one. Then the delta of the PERCS can be computed, and the equivalent stock position can be determined.

Example: Using the same prices from the previous example, one can see how much stock he would have to sell in order to properly hedge his PERCS holding of 1,000 shares.

Assume XYZ is trading at 33, and the PERCS has two years until maturity. If the PERCS is redeemable at 39 at maturity, one can determine that the delta of the imbedded option is 0.30 (see previous example). Then:

$$\begin{aligned}\text{Delta of PERCS} &= 1 - \text{Delta of imbedded call}\\ &= 1 - 0.30\\ &= 0.70\end{aligned}$$

Hence, the equivalent stock position of 1,000 PERCS is 700 shares (1,000 × 0.70).

Consequently, one would sell short 700 shares of XYZ common in order to hedge this long holding of 1,000 PERCS.

This is not a static situation. If XYZ changes in price, the delta of the imbedded option will change as well, so that the proper amount of stock to sell as a hedge will change. The deltas will change with the passage of time as well. A change in volatility of the common stock can affect the deltas, too. Consequently, *one must constantly recalculate the amount of stock needed to hedge the PERCS.*

What one has actually created by selling some common stock against his long PERCS holding is another ratio write. Consider the fact that being long 1,000 PERCS shares is the equivalent of being long 1,000 common and short 10 imbedded, long-term calls. If one sells 700 common, he will be left with an equivalent position of long 300 common and short 10 imbedded calls – a ratio write.

The person who chooses to hedge his PERCS holding with a partial sale of common stock, as in the example, would do well to visualize the resulting hedged position as a neutral ratio write. Doing so will help him to realize that there is both upside and downside risk if the underlying common stock should become very volatile (ratio writes have risk on both the upside and the downside). If the common remains fairly stable, the value of the imbedded call will decrease and he will profit. However, if it is a long-term imbedded call (that is, if there is a long time until maturity of the PERCS), the rate of time decay will be quite small; the hedger should realize that fact as well.

In summary, the sale of some common against a long holding of PERCS is a viable way to hedge the position. When one hedges in this manner, he must continue to monitor the position and would be best served by viewing it as a ratio write at all times.

SELLING PERCS SHORT

Can it make sense to sell PERCS short? The payout of the large dividend seems to be a deterrent against such a short sale. However, if one views it as the opposite of a long-term, out-of-the-money covered write, it may make some sense.

A covered write is long stock, short call; it is also equivalent to being long a PERCS. The opposite of that is short stock, long call – a synthetic put. Therefore, *a long put is the equivalent of being short a PERCS.* Profit graph H in Appendix D shows the profit potential of being short stock and long a call. There is large downside profit potential, but the upside risk is limited by the presence of the long call. The amount of premium paid for the long call is a wasting asset. If the stock does not decline in price, the long call premium may be lost, causing an overall loss.

Shorting a PERCS would result in a position with those same qualities. The upside risk is limited by the redemption feature of the PERCS. The downside profit potential is large, because the PERCS will trade down in price if the common stock

does. The problem for the short seller of the PERCS is that he has to pay a lot for the imbedded call that affords him the protection from upside risk. The actual price that he has to pay is the dividends that he, as a short seller, must pay out. But this can also be thought of as having purchased a long-term call out-of-the-money as protection for a short sale of common stock. The long-term call is bound to be expensive, since it has a great deal of time premium remaining; moreover, the fact that it is out-of-the-money means that one is also assuming the price risk from the current common price up to the strike of the call. Hence, this out-of-the-money amount plus the time value premium of the imbedded call can add up to a substantial amount.

This discussion mainly pertains to shorting a PERCS near its issuance price and date. However, one is free to short PERCS at any time if they can be borrowed. They may be a more attractive short when they have less time remaining until the maturity date, or when the underlying common is closer to the redemption price.

Overall, one would not normally expect the short sale of a PERCS to be vastly superior to a synthetic put constructed with listed options. Arbitrageurs would be expected to eliminate such a price discrepancy if one exists. However, if such a situation does present itself, the short seller of the PERCS should realize he has a position that is the equivalent of owning a put, and plan his strategy accordingly.

DETERMINING THE ISSUE PRICE

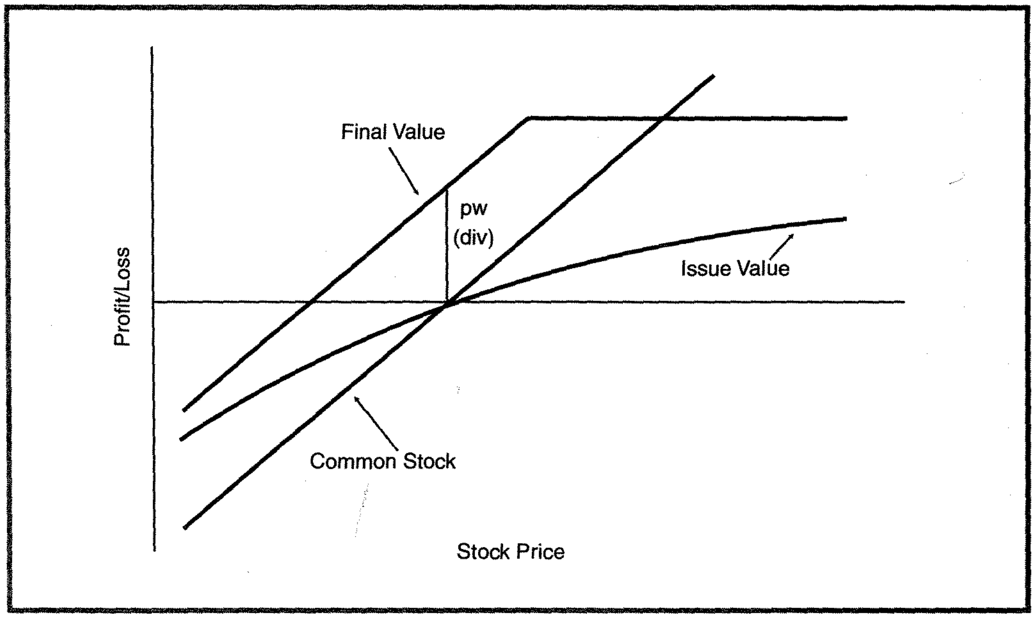
An investor might wonder how it is always possible for the PERCS and the common to be at the same price at the issue date. In fact, the issuing company has two variables to work with to ensure that the common price and the PERCS issue price are the same. One variable is the amount of the additional dividend that the PERCS will pay. The other is the redemption price of the PERCS. By altering these two items, the value of the covered write (i.e., the PERCS) can be made to be the same as the common on the issue date.

Figure 32-7 shows the values that are significant in determining the issue price of the PERCS. The line marked Final Value is the shape of the profit graph of a covered write at expiration. This is the PERCS's final value at its maturity. The curved line is the value of the covered write at the current time, well before expiration. Of course, these two are linked together.

The line marked Common Stock is merely the profit or loss of owning stock. The curved line (present PERCS value) crosses the Common Stock line at the issue price.

At the time of issuance, the difference between the current stock price and the eventual maturity value of the PERCS is the present value of all the additional dividends to be paid. That amount is marked as the vertical line on the graph. Therefore,

FIGURE 32-7.
3-year PERCS issue price.



anywhere out-of-the-money, the difference between the Final Value line and the Common Stock line, is the present worth of the additional dividends to be paid between now and maturity of the PERCS.

Thus, on the day the PERCS is to be issued (or shortly before), the issuing corporation can alter the PERCS dividend or demand price in order to "move" the curved line (present PERCS value) so that it intersects the Common Stock line at today's stock price. The terms of the PERCS would then be set to those parameters.

PRICING PERCS

The crucial factor in determining whether a PERCS is fairly priced lies in valuing the imbedded call option within the PERCS. This may be a somewhat subjective task, especially if the PERCS has a long time until maturity. Recall that it was shown that small changes in the assumptions for LEAPS calls can seriously alter their theoretical values. The same holds true for valuing the call within the PERCS. If one trader is using a volatility assumption of 25%, say, for the common stock and another is using 28%, then they are going to arrive at different values for a three-year call. In such a case, one trader may think the PERCS is expensive at its current price and another may think it is cheap.

Such discrepancies will be most notable when there is not a listed option that has terms near the terms of the PERCS's imbedded call. If there is such a listed option, then arbitrageurs should be able to use it and the common stock to bring the PERCS into line. However, if there is not any such listed option available, there may be opportunities for theoretical value traders.

Models used for pricing call options, such as the Black–Scholes model, are discussed in Chapter 28 on mathematical applications. These models can be used to value the imbedded call in the PERCS as well. If the strategist determines the implied value of the imbedded call is out of line, he may be able to make a profitable trade. It is a fairly simple matter to determine the implied value of the imbedded call. The formula to be used is:

$$\text{Imbedded call implied value} = \text{Current stock price} + \text{Present value of dividends} - \text{Current PERCS price}$$

The validity of this formula can be seen by referring again to Figure 32-7. The difference between the Final Value (that is, the profit of the covered write at expiration) and the Issue Value or current value of the PERCS is the imbedded call price. That is, the difference between the curved line and the line at expiration is merely the present time value of the imbedded call. Since this formula is describing an out-of-the-money situation, then the time value of the imbedded call is its entire price. It is also known that the Final Value line differs from the current stock price by the present value of all the additional dividends to be paid by the PERCS until maturity. Thus, the four variables are related by the simple formula given above.

Example: XYZ has fallen to 32 after the PERCS was issued. The PERCS is currently trading at 34 and, as in previous examples, the PERCS pays an additional \$1.50 per year in dividends. If there are two years remaining until maturity of the PERCS, what is the value of the imbedded call option?

First, calculate the present value of the additional dividends. One should calculate the present value of each dividend. Since they are paid quarterly, there will be eight of them between now and maturity.

Assume the short-term interest rate is 6%. Each additional quarterly dividend is \$0.375 (\$1.50 divided by 4). Thus, the present value of the dividend to be paid in three months is:

$$pw = 0.375/(1 + .06)^{1/4} = \$0.3696$$

The present value of the dividend to be paid two years from now is:

$$pw = 0.375/(1 + .06)^2 = \$0.338$$

Adding up all eight of these, it is determined that *the present worth of all the remaining additional dividends is $2.81.* Note that this is less than the actual amount that will eventually be paid over the two years, which is $3.00.

Now, using the simple formula given earlier, the value of the imbedded call can be determined:

XYZ: 32
PERCS: 34
Present worth of additional dividends: 2.81

$$\begin{aligned}\text{Imbedded call} &= \text{Stock price} + pw \text{ divs} - \text{PERCS price}\\ &= 32 + 2.81 - 34\\ &= 0.81\end{aligned}$$

Once this call value is determined, the strategist can use a model to see if this call appears to be cheap or expensive. In this case, the call looks cheap for a two-year call option that is 7 points out-of-the-money. Of course, one would need to know how volatile XYZ stock is, in order to draw a definitive conclusion regarding whether the imbedded call is undervalued or not.

A basic relationship can be drawn between the PERCS price and the calculated value of the imbedded call: *If the imbedded call is undervalued, then the PERCS is too expensive; if the imbedded call is overpriced, then the PERCS is cheap.* In this example, the value of the imbedded call was only 81 cents. If XYZ is a stock with average or above average volatility, then the call is certainly cheap. Therefore, the PERCS, trading at 34, is too expensive.

Once this determination has been made, the strategist must decide how to use the information. A buyer of PERCS will need to know this information to determine if he is paying too much for the PERCS; alternatively stated, he needs to know if he is selling the imbedded call too cheaply. A hedger might establish a true hedge by buying common and selling the PERCS, using the proper hedge ratio. It is possible for a PERCS to remain expensive for quite some time, if investors are buying it for the additional dividend yield alone and are not giving proper consideration to the limited profit potential. Nevertheless, both the outright buyer and the strategist should calculate the correct value of the PERCS in order to make rational decisions.

PERCS SUMMARY

A PERCS is a preferred stock with a higher dividend yield than the common, and it is demandable at a predetermined series of prices. The decision to demand is strictly at the discretion of the issuing company; the PERCS holder has no say in the deci-

sion. The PERCS is equivalent to a covered write of a long-term call option, which is imbedded in the PERCS value. Although there are not many PERCS trading at the current time, that number may grow substantially in the future.

Any strategies that pertain to covered call writing will pertain to PERCS as well. Conventional listed options can be used to protect the PERCS from downside risk, to remove the limited upside profit potential, or to effectively change the price at which the PERCS is redeemable. Ratio writes can be constructed by selling a listed call. Shorting PERCS creates a security that is similar to a long put, which might be quite expensive if there is a significant amount of time remaining until maturity of the PERCS.

Neutral traders and hedgers should be aware that a PERCS has a delta of its own, which is equal to one minus the delta of the imbedded call option. Thus, hedging PERCS with common stock requires one to calculate the PERCS delta.

Finally, the implied value of the call option that is imbedded with the PERCS can be calculated quite easily. That information is used to determine whether the PERCS is fairly priced or not. The serious outright buyer as well as the option strategist should make this calculation, since a PERCS is a security that is option-related. Either of these investors needs to know if he is making an attractive investment, and calculating the valuation of the imbedded call is the only way to do so.

OTHER STRUCTURED PRODUCTS

EXCHANGE-TRADED FUNDS

Other listed products exist that are simpler in nature than those already discussed, but that the exchanges sometimes refer to as structured products. They often take the form of unit trusts and mutual funds. The general term for these products is Exchange-Traded Funds (ETFs). In a unit trust, an underwriter (Merrill Lynch, for example) packages together 10 to 12 stocks that have similar characteristics; perhaps they are in the same industry group or sector. The underwriter forms a unit trust with these stocks. That is, the shares are held in trust and the resulting entity – the unit trust – can actually be traded as shares of its own. The units are listed on an exchange and trade just like stocks.

Example: One of the better-known and popular unit trusts is called the Standard & Poor's Depository Receipt (SPDR). It is a unit trust that exactly matches the S&P 500 index, divided by 10. The SPDR unit trust is affectionately called Spiders (or Spyders). It trades on the AMEX under the symbol SPY. If the S&P 500 index itself is at 1,400, for example, then SPY will be trading near 140. Unit trusts are very active, mostly because they allow any investor to buy an index fund, and to move in and out of it at will. The bid–asked spread differential is very tight, due to the liquidity of the

product. When a customer trades the SPY, he pays a commission, just as he would with any listed stock.

Exchange-traded funds are attractive to all investors who like to trade or invest in index funds, preferring the diversity provided by an index (passive management of stocks) to an active role in managing individual stocks. Exchange-traded funds can be sold short as long as the shares can be borrowed. Some of them don't even require an uptick when executing the short sale.

Two other large and well-known unit trusts are similar to SPY. One is the NASDAQ-100 tracking stock, whose symbol is QQQ. QQQ is 1/40th of the value of the NASDAQ-100 index ($NDX), although it should be noted that $NDX has split two-for-one in the past, as has QQQ, so the relationship could change by a factor of two. The other large, popular unit trust is linked to the Dow-Jones 30 Industrials; it is called Diamonds and trades under the symbol DIA. Both QQQ and DIA trade on the AMEX. Since this concept has proved to be popular, *sector SPDRs* were created on a large number of S&P index sectors – technology, oil, semiconductors, etc. These have proven to be less popular. There are even ETFs that are equal to one-tenth of the $OEX index, although they have not proven to be liquid.

ETFs are "created" by institutions in blocks of shares known as Creation Units. A creation requires a deposit with the trustee of a specified number of shares of a portfolio of stocks closely approximating the composition of a specific index, and cash equal to accumulated dividends in return for specific index shares. Similarly, block-sized units of ETFs can be redeemed in return for a portfolio of stocks approximating the index and a specified amount of cash. Very large blocks of shares – 50,000 or more – are required to create SPY, QQQ, DIA, and so forth. Slightly smaller blocks of shares are required to create the sector funds.

If one is interested in knowing exactly what funds are listed at any time, he should consult the Web site of the exchange where the ETF is listed. The AMEX generally has extensive information about the nature of these products on its site at www.amex.com.

A very large segment of ETFs, called iShares, was created by Barclays Global Investors to track all kinds of index funds. Many of these are not well known to the public, such as the Russell 2000 Value Fund and the Russell 2000 Growth Fund, but most of them are understandable upon inspection. There are iShares on funds that track foreign industries, plus a broad spectrum of funds that track small-cap stocks, value stocks, growth stocks, or individual sectors such as health care, the Internet, or real estate. A Web site, www.ishares.com, shows all of the currently available iShares. The iShares are all traded on major stock exchanges.

Another major segment of ETFs are called Holding Company Depository Receipts (HOLDRS). They were created by Merrill Lynch and are listed on the AMEX.

Options on ETFs. Options are listed on many ETFs. QQQ options, for example, are listed on all of the option exchanges and are some of the most liquid contracts in existence. Things can always change, of course: Witness OEX, which at one time traded a million contracts a day and now barely trades one-thirtieth of that on most days.

The options on ETFs can be used as substitutes for many expensive indices. This brings index option trading more into the realm of reasonable cost for the small individual investor.

Example: The PHLX Semiconductor index ($SOX) has been a popular index since its inception, especially during the time that tech stocks were roaring. The index, whose options are expensive because of its high statistical volatility, traded at prices between 500 and 1,300 for several years. During that time, both implied and historical volatility was near 70%. So, for example, if $SOX were at 1,000 and one wanted to buy a three-month at-the-money call, it would cost approximately 135 points. That's $13,500 for *one* call option. For many investors, that's out of the realm of feasibility.

However, there are HOLDRS known as Semiconductor HOLDRS (symbol: SMH). The Semiconductor HOLDRS are composed of 20 stocks (in differing quantities, since it is a capitalization-weighted unit trust) that behave in aggregate in much the same manner as the Semiconductor index ($SOX) does. However, SMH has traded at prices between 40 and 100 over the same period of time that $SOX was trading between 500 and 1,300. The implied volatility of SMH options is 70% – just like $SOX options – because the same stocks are involved in both indices. However, a three-month at-the-money call on the $100 SMH, say, would cost only 13.50 points ($1,350) – a much more feasible option cost for most investors and traders.

Thus, a strategy that most option traders should keep in mind is one in which ETFs are substituted when one has a trading signal or opinion on a high-priced index. Similarities exist among many of them. For example, the Morgan Stanley High-Tech index ($MSH) is well known for the reliability of its put–call ratio sentiment signals. However, the index is high-priced and volatile, much like $SOX. Upon examination, though, one can discover that QQQ trades almost exactly like $MSH. So QQQ options and "stock" can be used as a substitute when one wants to trade $MSH.

STRUCTURED PRODUCT SUMMARY

Structured products – whether of the simple style of the Exchange-Traded Fund or the more complicated nature of the PERCS, bull spreads, or protected index funds – can and should be utilized by investors looking for unique ways to protect long-term holdings in indices or individual stocks.

The number of these products is constantly evolving and changing. Thus, anyone interested in trading these items should check the Web sites of the exchanges where the shares are listed. Analytical tools are available on the Web as well. For example, the site www.derivativesmodels.com has over 40 different models especially designed for evaluating options and structured products. They range from the simple Black–Scholes model to models that are designed to evaluate extremely complicated exotic options.

All of these products have a place, but the most conservative seem to be the structured products that provide upside market potential while limiting downside risk – the products discussed at the beginning of the chapter. As long as the credit-worthiness of the underwriter is not suspect, such products can be useful longer-term investments for nearly everyone who bothers to learn about and understand them.

CHAPTER 33

Mathematical Considerations for Index Products

In this chapter, we look at some riskless arbitrage techniques as they apply to index options. Then a summary of mathematical techniques, especially modeling, is presented.

ARBITRAGE

Most of the normal arbitrage strategies have been described previously. We will review them here, concentrating on specific techniques not described in previous chapters on hedging (market baskets) and index spreading.

DISCOUNTING

We saw that discounting in cash-based options is done with in-the-money options as it is with stock options. However, since the discounter cannot exactly hedge the cash-based options, he will normally do his discounting near the close of the day so that there is as little time as possible between the time the option is bought and the close of the market. This reduces the risk that the underlying index can move too far before the close of trading.

Example: OEX is trading at 673.53 and an arbitrageur can buy the June 690 puts for 16. That is a discount of 0.47 since parity is 16.47. Is this enough of a discount? That is, can the discounter buy this put, hold it unhedged until the close of trading, and

exercise it; or is there too great a chance that OEX will rally and wipe out his discount?

If he buys this put when there is very little time left in the trading day, it *might* be enough of a discount. Recall that a one-point move in OEX is roughly equivalent to 15 points on the Dow (while a one-point move in SPX is about 7.5 Dow points). Thus, this OEX discount of 0.47 is about equal to 7 Dow points. Obviously, this is not a lot of cushion, because the Dow can easily move that far in a short period of time, so it would be sufficient only if there are just a few minutes of trading left and there were not previous indications of large orders to buy "market on close."

However, if this situation were presented to the discounter at an earlier time in the trading day, he might defer because he would have to hedge his position and that might not be worth the trouble. If there were several hours left in the trading day, even a discount of a full point would not be enough to allow him to remain unhedged (one full OEX point is about 15 Dow points). Rather, he would, for example, buy futures, buy OEX calls, or sell puts on another index. At the end of the day, he could exercise the puts he bought at a discount and reverse the hedge in the open market.

CONVERSIONS AND REVERSALS

Conversions and reversals in cash-based options are really the market basket hedges (index arbitrage) described in Chapter 30. That is, the underlying security is actually all the stocks in the index. However, the more standard conversions and reversals can be executed with futures and futures options.

Since there is no credit to one's account for selling a future and no debit for buying one, most futures conversions and reversals trade very nearly at a net price equal to the strike. That is, the value of the out-of-the-money futures option is equal to the time premium of the in-the-money option that is its counterpart in the conversion or reversal.

Example: An index future is trading at 179.00. If the December 180 call is trading for 5.00, then the December 180 put should be priced near 6.00. The time value premium of the in-the-money put is 5.00 (6.00 + 179.00 – 180.00), which is equal to the price of the out-of-the-money call at the same strike.

If one were to attempt to do a conversion or reversal with these options, he would have a position with no risk of loss but no possibility of gain: A reversal would be established, for example, at a "net price" of 180. Sell the future at 179, add the premium of the put, 6.00, and subtract the cost of the call, 5.00: 179 + 6.00 – 5.00 = 180.00. As we know from Chapter 27 on arbitrage, one unwinds a conversion or reversal for a "net price" equal to the strike. Hence, there would be no gain or loss from this futures reversal.

For index futures options, there is no risk when the underlying closes near the strike, since they settle for cash. One is not forced to make a choice as to whether to exercise his calls. (See Chapter 27 on arbitrage for a description of risks at expiration when trading reversals or conversions.)

In actual practice, floor traders may attempt to establish conversions in futures options for small increments – perhaps 5 or 10 cents in S&P futures, for example. The arbitrageur should note that futures options do actually create a credit or debit in the account. That is, they are like stock options in that respect, even though the underlying instrument is not. This means that if one is using a deep in-the-money option in the conversion, there will actually be some carrying cost involved.

Example: An index future is trading at 179.00 and one is going to price the December 190 conversion, assuming that December expiration is 50 days away. Assume that the current carrying cost of money is 10% annually. Finally, assume that the December 190 call is selling for 1.00, and the December 190 put is selling for 11.85. Note that the put has a time value premium of only 85 cents, less than the premium of the call. The reason for this is that one would have to pay a carrying cost to do the December 190 conversion.

If one established the 190 conversion, he would buy the futures (no credit or debit to the account), buy the put (a debit of 11.85), and sell the call (a credit of 1.00). Thus, the account actually incurs a debit of 10.85 from the options. The carrying cost for 10.85 at 10% for 50 days is $10.85 \times 10\% \times 50/365 = 0.15$. This indicates that the converter is willing to pay 15 cents less time premium for the put (or conversely that the reversal trader is willing to sell the put for 15 cents less time premium). Instead of the put trading with a time value premium equal to the call price, the put will trade with a premium of 15 cents less. Thus, the time premium of the put is 85 cents, rather than being equal to the price of the call, 1.00.

BOX SPREADS

Recall that a "box" consists of a bullish vertical spread involving two striking prices, and a bearish vertical spread using the same two strikes. One spread is constructed with puts and the other with calls. The profitability of the box is the same regardless of the price of the underlying security at expiration.

Box arbitrage with equity options involves trying to buy the box for less than the difference in the striking prices, for example, trying to buy a box in which the strikes are 5 points apart for 4.75. Selling the box for more than 5 points would represent arbitrage as well. In fact, even selling the box at exactly 5 points would produce a profit for the arbitrageur, since he earns interest on the credit from the sale.

These same strategies apply to options on futures. However, boxes on cash-based options involve another consideration. It is often the case with cash-based options that the box sells for more than the difference in the strikes. For example, a box in which the strikes are 10 points apart might sell for 10.50, a substantial premium over the striking price differential. The reason that this happens is because of the possibility of early assignment. The seller of the box assumes that risk and, as a result, demands a higher price for the box.

If he sells the box for half a point more than the striking price differential, then he has a built-in cushion of .50 point of index movement if he were to be assigned early. In general, box strategies are not particularly attractive. However, if the premium being paid for the box is excessively high, then one should consider selling the box. Since there are four commissions involved, this is not normally a retail strategy.

MATHEMATICAL APPLICATIONS

The following material is intended to be a companion to Chapter 28 on mathematical applications. Index options have a few unique properties that must be taken into account when trying to predict their value via a model.

The Black–Scholes model is still the model of choice for options, even for index options. Other models have been designed, but the Black–Scholes model seems to give accurate results without the extreme complications of most of the other models.

FUTURES

Modeling the fair value of most futures contracts is a difficult task. The Black–Scholes model is not usable for that task. Recall that we saw earlier that the fair value of a future contract on an index could be calculated by computing the present value of the dividend and also knowing the savings in carrying cost of the futures contract versus buying the actual stocks in the index.

CASH-BASED INDEX OPTIONS

The futures fair value model for a capitalization-weighted index requires knowing the exact dividend, dividend payment date, and capitalization of each stock in the index (for price-weighted indices, the capitalization is unnecessary). This is the only way of getting the accurate dividend for use in the model. The same dividend calculation must be done for any other index before the Black–Scholes formula can be applied.

In the actual model, the dividend for cash-based index options is used in much the same way that dividends are used for stock options: The present value of the div-

idend is subtracted from the index price and the model is evaluated using that adjusted stock price. With stock options, there was a second alternative – shortening the time to expiration to be equal to the ex-date – but that is not viable with index options since there are numerous ex-dates.

Let's look at an example using the same fictional dividend information and index that were used in Chapter 30 on stock index hedging strategies.

Example: Assume that we have a capitalization-weighted index composed of three stocks: AAA, BBB, and CCC. The following table gives the pertinent information regarding the dividends and floats of these three stocks:

Stock	Dividend Amount	Days until Dividend	Float
AAA	1.00	35	50,000,000
BBB	0.25	60	35,000,000
CCC	0.60	8	120,000,000
Divisor:	150,000,000		

One first computes the present worth of each stock's dividend, multiplies that amount by the float, and then divides by the index divisor. The sum of these computations for each stock gives the total dividend for the index. The present worth of the dividend for this index is \$0.8667.

Assume that the index is currently trading at 175.63 and that we want to evaluate the theoretical value of the July 175 call. Then, using the Black–Scholes model, we would perform the following calculations:

1. Subtract the present worth of the dividend, 0.8667, from the current index price of 175.63, giving an adjusted index price of 174.7633.
2. Evaluate the call's fair value using 174.7633 as the stock price. All other variables are as they are for stocks, including the risk-free interest rate at its actual value (10%, for example).

The theoretical value for puts is computed in the same way as for equity options, by using the arbitrage model. This is sufficient for cash-based index options because it is possible – albeit difficult – to hedge these options by buying or selling the entire index. Thus, the options should reflect the potential for such arbitrage. The put value should, of course, reflect the potential for dividend arbitrage with the index. The arbitrage valuation model presented in Chapter 28 on modeling called for the dividend to be used. For these index puts, one would use the present worth of

the dividend on the index – the same one that was used for the call valuation, as in the last example.

THE IMPLIED DIVIDEND

If one does not have access to all of the dividend information necessary to make the "present worth of the dividends" calculation (i.e., if he is a private individual or public customer who does not subscribe to a computer-based dividend "service"), there is still a way to estimate the present worth of the dividend. All one need do is make the assumption that the market-makers know what the present worth of the dividend is, and are thus pricing the options accordingly. The individual public customer can use this information to deduce what the dividend is.

Example: OEX is trading at 700, the June options have 30 days of life remaining, the short-term interest rate is 10%, and the following prices exist:

June 700 call: 18.00

June 700 put: 14.50

One can use iterations of the Black–Scholes model to determine what the OEX "dividend" is. In this case, it turns out to be something on the order of $2.10.

Briefly, these are the steps that one would need to follow in order to determine this dividend:

1. Assume the dividend is $0.00.
2. Using the assumed dividend, use the Black–Scholes model to determine the implied volatility of the call option, whose price is known (18.00 in the above example).
3. Using the implied volatility determined from step 2 and the assumed dividend, is the arbitrage put value as derived from the Black–Scholes calculations at the end of step 2 roughly equal to the market value of the put (14.50 in the above example)? If yes, you are done. If not, increase the assumed dividend by some nominal amount, say $0.10, and return to step 2.

Thus, without having access to complete dividend information, one can use the information provided to him by the marketplace in order to *imply* the dividend of an index option. The only assumption one makes is that the market-makers know what the dividend is (they most assuredly do). Note that the implied volatility of the options is determined concurrently with the implied dividend (step 2 above). A very useful tool, this simple "implied dividend calculator" can be added to any software that employs the Black–Scholes model.

EUROPEAN EXERCISE

To account for European exercise, one basically ignores the fact that an in-the-money put option's minimum value is its intrinsic value. European exercise puts can trade at a discount to intrinsic value. Consider the situation from the viewpoint of a conversion arbitrage. If one buys stock, buys puts, and sells calls, he has a conversion arbitrage. In the case of a European exercise option, he is forced to carry the position to expiration in order to remove it: He cannot exercise early, nor can he be called early. Therefore, his carrying costs will always be the maximum value to expiration. These carrying costs are the amount of the discount of the put value.

For a deeply in-the-money put, the discount will be equal to the carrying charges required to carry the striking price to expiration:

$$\text{Carry} = s\left[1 - \frac{1}{(1+r)^t}\right]$$

Less deeply in-the-money puts, that is, those with deltas less than −1.00, would not require the full discounting factor. Rather, one could multiply the discounting factor by the absolute value of the put's delta to arrive at the appropriate discounting factor.

FUTURES OPTIONS

A modified Black–Scholes model, called the Black Model, can be used to evaluate futures options. See Chapter 29 on futures for a futures discussion. Essentially, the adjustment is as follows: Use 0% as the risk-free rate in the Black–Scholes model and obtain a theoretical call value; then discount that result.

Black model:

$$\text{Call value} = e^{-rt} \times \text{Black–Scholes call value [using } r = 0\%]$$

where

r is the risk-free interest rate

and t is the time to expiration in years.

The relationship between a futures call theoretical value and that of a put can also be discussed from the model:

$$\text{Call} = \text{Put} + e^{-rt}(f - s)$$

where

f is the futures price

and s is the striking price.

Example: The following prices exist:

ZYX Cash Index: 174.49

ZYX December future: 177.00

There are 80 days remaining until expiration, the volatility of ZYX is 15%, and the risk-free interest rate is 6%.

In order to evaluate the theoretical value of a ZYX December 185 call, the following steps would be taken:

1. Evaluate the regular Black–Scholes model using 185 as the strike, 177.00 as the stock price, 15% as the volatility, 0.22 as the time remaining (80/365), *and 0% as the interest rate.* Note that the *futures price,* not the index price, is input to the model as stock price.

   Suppose that this yields a result of 2.05.
2. Discount the result from step 1:

$$\text{Black Model call value} = e^{-(.06 \times 0.22)} \times 2.05 = 2.02$$

In this case, the difference between the Black model and the Black–Scholes model is small (3 cents). However, the discounting factor can be large for longer-term or deeply in-the-money options.

The other items of a mathematical nature that were discussed in Chapter 28 on mathematical applications are applicable, without change, to index options. Expected return and implied volatility have the same meaning. Implied volatility can be calculated by using the Black–Scholes formulas as specified above.

Neutral positioning retains its meaning as well. Recall that any of the above theoretical value computations gives the delta of the option as a by-product. These deltas can be used for cash-based and futures options just as they are used for stock options to maintain a neutral position. This is done, of course, by calculating the equivalent stock position (or equivalent "index" or "futures" position, in these cases).

FOLLOW-UP ACTION

The various types of follow-up action that were applicable to stock options are available for index options as well. In fact, when one has spread options on the same underlying index, these actions are virtually the same. However, when one is doing inter-index spreads, there is another type of follow-up picture that is useful. The rea-

son for this is that the spread will have different outcomes not only based on the price of one index, but also based on that index's relationship to the other index.

It is possible, for example, that a mildly bullish strategy implemented as an inter-index spread might actually lose money even if one index rose. This could happen if the other index performed in a manner that was not desirable. If one could have his computer "draw" a picture of several different outcomes, he would have a better idea of the profit potential of his strategy.

Example: Assume a put spread between the ZYX and the ABX indices was established. An ABX June 180 put was bought at 3.00 and a ZYX June 175 put was sold at 3.00, when the ZYX was at 175.00 and the ABX Index was at 178.00. This spread will obviously have different outcomes if the prices of the ZYX and the ABX move in dramatically different patterns.

On the surface, this would appear to be a bearish position – long a put at a higher strike and short a put at a lower strike. However, the position could make money even in a rising market if the indices move appropriately: If, at expiration, the ZYX and ABX are both at 179.00, for example, then the short option expires worthless and the long option is still worth 1.00. This would mean that a 1-point profit, or $500, was made in the spread ($1,500 profit on the short ZYX puts less a $1,000 loss on the one ABX put).

Conversely, a downward movement doesn't guarantee profits either. If the ZYX falls to 170.00 while the ABX declines to 175.00, then both puts would be worth 5 at expiration and there would be no gain or loss in the spread.

What the strategist needs in order to better understand his position is a "sliding scale" picture. That is, most follow-up pictures give the outcome (say, at expiration) of the position at various stock or index prices. That is still needed: One would want to see the outcome for ZYX prices of, say, 165 up to 185 in the example. However, in this spread something else is needed: The outcome should also take into account how the ZYX matches up with the ABX. Thus, one might need three (or more) tables of outcomes, each of which depicts the results as ZYX ranges from 165 up to 185 at expiration. One might first show how the results would look if ZYX were, say, 5 points below ABX; then another table would show ZYX and ABX unchanged from their original relationship (a 3-point differential); finally, another table would show the results if ZYX and ABX were equal at expiration.

If the relationship between the two indices were at 3 points at expiration, such a table might look like this:

	Price at Expiration				
ZYX	165	170	175	180	185
ABX	168	173	178	183	188
ZYX June 175P	10	5	0	0	0
ABX June 180P	12	7	2	0	0
Profit	+$1,000	+$1,000	+$1,000	0	0

This picture indicates that the position is neutral to bearish, since it makes money even if the indices are unchanged. However, contrast this with the situation in which the ZYX falls to a level 5 points below the ABX by expiration.

	Price at Expiration				
ZYX	165	170	175	180	185
ABX	170	175	180	185	190
ZYX June 175P	10	5	0	0	0
ABX June 180P	10	5	0	0	0
Profit	0	0	0	0	0

In this case, the spread has no potential for profit at all, even if the market collapses. Thus, even a bearish spread like this might not prove profitable if there is an adverse movement in the relationship of the indices.

Finally, observe what happens if the ZYX rallies so strongly that it catches up to the ABX.

	Price at Expiration				
ZYX	165	170	175	180	185
ABX	165	170	175	180	185
ZYX June 175P	10	5	0	0	0
ABX June 180P	15	10	5	0	0
Profit	+$2,500	+$2,500	+$2,500	+$2,500	+$2,500

These tables can be called "sliding scale" tables, because what one is actually doing is showing a different set of results by sliding the ABX scale over slightly each time while keeping the ZYX scale fixed. Note that in the above two tables, the ZYX results are unchanged, but the ABX has been slid over slightly to show a different result. Tables like this are necessary for the strategist who is doing spreads in options with different underlying indices or is trading inter-index spreads.

	Price at Expiration				
ZYX	165	170	175	180	185
ABX	168	173	178	183	188
ZYX June 175P	10	5	0	0	0
ABX June 180P	12	7	2	0	0
Profit	+$1,000	+$1,000	+$1,000	0	0

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	Price at Expiration				
ZYX	165	170	175	180	185
ABX	170	175	180	185	190
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ABX June 180P	10	5	0	0	0
Profit	0	0	0	0	0

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Finally, observe what happens if the ZYX rallies so strongly that it catches up to the ABX.

	Price at Expiration				
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ZYX June 175P	10	5	0	0	0
ABX June 180P	15	10	5	0	0
Profit	+$2,500	+$2,500	+$2,500	+$2,500	+$2,500

These tables can be called "sliding scale" tables, because what one is actually doing is showing a different set of results by sliding the ABX scale over slightly each time while keeping the ZYX scale fixed. Note that in the above two tables, the ZYX results are unchanged, but the ABX has been slid over slightly to show a different result. Tables like this are necessary for the strategist who is doing spreads in options with different underlying indices or is trading inter-index spreads.

The astute reader will notice that the above example can be generalized by drawing a three-dimensional graph. The X axis would be the price of ZYX; the Y axis would be the dollars of profit in the spread; and instead of "sliding scales," the Z axis would be the price of ABX. There is software that can draw 3-dimensional profit graphs, although they are somewhat difficult to read. The previous tables would then be horizontal planes of the three-dimensional graph.

This concludes the chapter on riskless arbitrage and mathematical modeling. Recall that arbitrage in stock options can affect stock prices. The arbitrage techniques outlined here do not affect the indices themselves. That is done by the market basket hedges. It was also known that no new models are necessary for evaluation. For index options, one merely has to properly evaluate the dividend for usage in the standard Black–Scholes model. Future options can be evaluated by setting the risk-free interest rate to 0% in the Black–Scholes model and discounting the result, which is the Black model.

CHAPTER 34

Futures and Futures Options

In the previous chapters on index trading, a particular type of futures option – the index option – was described in some detail. In this chapter, some background information on futures themselves is spelled out, and then the broad category of futures options is investigated. In recent years, options have been listed on many types of futures as well as on some physical entities. These include options on things as diverse as gold futures and cattle futures, as well as options on currency and bond futures.

Much of the information in this chapter is concerned with describing the ways that futures options are similar to, or different from, ordinary equity and index options. There are certain strategies that can be developed specifically for futures options as well. However, it should be noted that once one understands an option strategy, it is generally applicable no matter what the underlying instrument is. That is, a bull spread in gold options entails the same general risks and rewards as does a bull spread in any stock's options – limited downside risk and limited upside profit potential. The gold bull spread would make its maximum profit if gold futures were above the higher strike of the spread at expiration, just as an equity option bull spread would do if the stock were above the higher strike at expiration. Consequently, it would be a waste of time and space to go over the same strategies again, substituting soybeans or orange juice futures, say, for XYZ stock in all the examples that have been given in the previous chapters of this book. Rather, the concentration will be on areas where there is truly a new or different strategy that futures options provide.

Before beginning, it should be pointed out that futures contracts and futures options have far less standardization than equity or index options do. Most futures trade in different units. Most options have different expiration months, expiration times, and striking price intervals. All the different contract specifications are not spelled out here. One should contact his broker or the exchange where the contracts

are traded in order to receive complete details. However, whenever examples are used, full details of the contracts used in those examples are given.

FUTURES CONTRACTS

Before getting into options on futures, a few words about futures contracts themselves may prove beneficial. Recall that a futures contract is a standardized contract calling for the delivery of a specified quantity of a certain commodity at some future time. Future contracts are listed on a wide variety of commodities and financial instruments. In some cases, one must make or take delivery of a specific quantity of a physical commodity (50,000 bushels of soybeans, for example). These are known as futures on physicals. In others, the futures settle for cash as do the S&P 500 Index futures described in a previous chapter; there are other futures that have this same feature (Eurodollar time deposits, for example). These types of futures are cash-based, or cash settlement, futures.

In terms of total numbers of contracts listed on the various exchanges, the more common type of futures contract is one with a physical commodity underlying it. These are sometimes broken down into subcategories, such as agricultural futures (those on soybeans, oats, coffee, or orange juice) and financial futures (those on U.S. Treasury bonds, bills, and notes).

Traders not familiar with futures sometimes get them confused with options. There really is very little resemblance between futures and options. *Think of futures as stock with an expiration date.*

That is, futures contracts can rise dramatically in price and can fall all the way to nearly zero (theoretically), just as the price of a stock can. Thus, there is great potential for risk. Conversely, with ownership of an option, risk is limited. The only real similarity between futures and options is that both have an expiration date. In reality, futures behave much like stock, and the novice should understand that concept before moving on.

HEDGING

The primary economic function of futures markets is hedging – taking a futures position to offset the risk of actually owning the physical commodity. The physical commodity or financial instrument is known as the "cash." For index futures, this hedging was designed to remove the risk from owning stocks (the "cash market" that underlies index futures). A portfolio manager who owned a large quantity of stocks could sell index futures against the stock to remove much of the price risk of that

stock ownership. Moreover, he is able to establish that hedge at a much smaller commission cost and with much less work than would be required to sell thousands of shares of stock. Similar thinking applies to all the cash markets that underlie futures contracts. The ability to hedge is important for people who must deal in the "cash" market, because it gives them price protection as well as allowing them to be more efficient in their pricing and profitability. A general example may be useful to demonstrate the hedging concept.

Example: An international businessman based in the United States obtains a large contract to supply a Swiss manufacturer. The manufacturer wishes to pay in Swiss francs, but the payment is not due until the goods are delivered six months from now. The U.S. businessman is obviously delighted to have the contract, but perhaps is not so delighted to have the contract paid in francs six months from now. If the U.S. dollar becomes stronger relative to the Swiss franc, the U.S. businessman will be receiving Swiss francs which will be worth fewer dollars for his contract than he originally thought he would. In fact, if he is working on a narrow profit margin, he might even suffer a loss if the Swiss franc becomes too weak with respect to the dollar.

A futures contract on the Swiss franc may be appropriate for the U.S. businessman. He is "long" Swiss francs via his contract (that is, he will get francs in six months, so he is exposed to their fluctuations during that time). He might sell short a Swiss franc futures contract that expires in six months in order to lock in his current profit margin. Once he sells the future, he locks in a profit no matter what happens.

The future's profit and loss are measured in dollars since it trades on a U.S. exchange. If the Swiss franc becomes stronger over the six-month period, he will lose money on the futures sale, but will receive more dollars for the sale of his products. Conversely, if the franc becomes weak, he will receive fewer dollars from the Swiss businessman, but his futures contract sale will show a profit. In either case, the futures contract enables him to lock in a future price (hence the name "futures") that is profitable to him at today's level.

The reader should note that there are certain specific factors that the hedger must take into consideration. Recall that the hedger of stocks faces possible problems when he sells futures to hedge his stock portfolio. First, there is the problem of selling futures below their fair value; changes in interest rates or dividend payouts can affect the hedge as well. The U.S. businessman who is attempting to hedge his Swiss francs may face similar problems. Certain items such as short-term interest rates, which affect the cost of carry, and other factors may cause the Swiss franc futures to trade at a premium or discount to the cash price. That is, there is not necessarily a complete one-to-one relationship between the futures price and the cash price.

However, the point is that the businessman is able to substantially reduce the currency risk, since in six months there could be a large change in the relationship between the U.S. dollar and the Swiss franc. While his hedge might not eliminate every bit of the risk, it will certainly get rid of a very large portion of it.

SPECULATING

While the hedgers provide the economic function of futures, speculators provide the liquidity. The attraction for speculators is leverage. One is able to trade futures with very little margin. Thus, large percentages of profits and losses are possible.

Example: A futures contract on cotton is for 50,000 pounds of cotton. Assume the March cotton future is trading at 60 (that is, 60 cents per pound). Thus, one is controlling $30,000 worth of cotton by owning this contract ($0.60 per pound × 50,000 pounds). However, assume the exchange minimum margin is $1,500. That is, one has to initially have only $1,500 to trade this contract. This means that one can trade cotton on 5% margin ($1,500/$30,000 = 5%).

What is the profit or risk potential here? A one-cent move in cotton, from 60 to 61, would generate a profit of $500. One can always determine what a one-cent move is worth as long as he knows the contract size. For cotton, the size is 50,000 pounds, so a one-cent move is 0.01 × 50,000 = $500.

Consequently, if cotton were to fall three cents, from 60 to 57, this speculator would lose 3 × $500, or $1,500 – his entire initial investment. Alternatively, a 3-cent move to the upside would generate a profit of $1,500, a 100% profit.

This example clearly demonstrates the large risks and rewards facing a speculator in futures contracts. Certain brokerage firms may require the speculator to place more initial margin than the exchange minimum. Usually, the most active customers who have a sufficient net worth are allowed to trade at the exchange minimum margins; other customers may have to put up two or three times as much initial margin in order to trade. This still allows for a lot of leverage, but not as much as the speculator has who is trading with exchange minimum margins. Initial margin requirements can be in the form of cash or Treasury bills. Obviously, if one uses Treasury bills to satisfy his initial margin requirements, he can be earning interest on that money while it serves as collateral for his initial margin requirements. If he uses cash for the initial requirement, he will not earn interest. (Note: Some large customers do earn credit on the cash used for margin requirements in their futures accounts, but most customers do not.)

A speculator will also be required to keep his account current daily through the use of maintenance margin. His account is marked to market daily, so unrealized

gains and losses are taken into account as well as are realized ones. If his account loses money, he must add cash into the account or sell out some of his Treasury bills in order to cover the loss, on a daily basis. However, if he makes money, that unrealized profit is available to be withdrawn or used for another investment.

Example: The cotton speculator from the previous example sees the price of the March cotton futures contract he owns fall from 60.00 to 59.20 on the first day he owns it. This means there is a $400 unrealized loss in his account, since his holding went down in price by 0.80 cents and a one-cent move is worth $500. He must add $400 to his account, or sell out $400 worth of T-bills.

The next day, rumors of a drought in the growing areas send cotton prices much higher. The March future closes at 60.90, up 1.70 from the previous day's close. That represents a gain of $850 on the day. The entire $850 could be withdrawn, or used as initial margin for another futures contract, or transferred to one's stock market account to be used to purchase another investment there.

Without speculators, a futures contract would not be successful, for the speculators provide liquidity. Volatility attracts speculators. If the contract is not trading and open interest is small, the contract may be delisted. The various futures exchanges can delist futures just as stocks can be delisted by the New York Stock Exchange. However, when stocks are delisted, they merely trade over-the-counter, since the corporation itself still exists. When futures are delisted, they disappear – there is no over-the-counter futures market. Futures exchanges are generally more aggressive in listing new products, and delisting them if necessary, than are stock exchanges.

TERMS

Futures contracts have certain standardized terms associated with them. However, trading in each separate commodity is like trading an entirely different product. The standardized terms for soybeans are completely different from those for cocoa, for example, as might well be expected. The size of the contract (50,000 pounds in the cotton example) is often based on the historical size of a commodity delivered to market; at other times it is merely a contrived number ($100,000 face amount of U.S. Treasury bonds, for example).

Also, futures contracts have expiration dates. For some commodities (for example, crude oil and its products, heating oil and unleaded gasoline), there is a futures contract for every month of the year. Other commodities may have expirations in only 5 or 6 calendar months of the year. These items are listed along with the quotes in a good financial newspaper, so they are not difficult to discover.

The number of expiration months listed at any one time varies from one market to another. Eurodollars, for example, have futures contracts with expiration dates that extend up to ten years in the future. T-bond and 10-year note contracts have expiration dates for only about the next year or so. Soybean futures, on the other hand, have expirations going out about two years, as do S&P futures.

The day of the expiration month on which trading ceases is different for each commodity as well. It is not standardized, as the third Friday is for stock and index options.

Trading hours are different, even for different commodities listed on the same futures exchange. For example, U.S. Treasury bond futures, which are listed on the Chicago Board of Trade, have very long trading hours (currently 8:20 A.M. to 3 P.M. and also 7 P.M. to 10:30 P.M. every day, Eastern time). But, on the same exchange, soybean futures trade a very short day (10:30 A.M. to 2:15 P.M., Eastern time). Some markets alter their trading hours occasionally, while others have been fixed for years. For example, as the foreign demand for U.S. Treasury bond futures increases, the trading hours might expand even further. However, the grain markets have been using these trading hours for decades, and there is little reason to expect them to change in the future.

Units of trading vary for different futures contracts as well. Grain futures trade in eighths of a point, 30-year bond futures trade in thirty-seconds of a point, while the S&P 500 futures trade in 10-cent increments (0.10). Again, it is the responsibility of the trader to familiarize himself with the units of trading in the futures market if he is going to be trading there.

Each futures contract has its own margin requirements as well. These conform to the type of margin that was described with respect to the cotton example above: An initial margin may be advanced in the form of collateral, and then daily mark-to-market price movements are paid for in cash or by selling some of the collateral. Recall that maintenance margin is the term for the daily mark to market.

Finally, futures are subject to position limits. This is to prevent any one entity from attempting to corner the market in a particular delivery month of a commodity. Different futures have different position limits. This is normally only of interest to hedgers or very large speculators. The exchange where the futures trade establishes the position limit.

TRADING LIMITS

Most futures contracts have some limit on their maximum daily price change. For index futures, it was shown that the limits are designed to act like circuit breakers to prevent the stock market from crashing. Trading limits exist in many futures con-

tracts in order to help ensure that the market cannot be manipulated by someone forcing the price to move tremendously in one direction or the other. Another reason for having trading limits is ostensibly to allow only a fixed move, approximately equal to or slightly less than the amount covered by the initial margin requirement, so that maintenance margin can be collected if need be. However, limits have been applied to all futures, some of which don't really seem to warrant a limit – U.S. Treasury bonds, for example. The bond issue is too large to manipulate, and there is a liquid "cash" bond market to hedge with.

Regardless, limits are a fact of life in futures trading. Each individual commodity has its own limits, and those limits may change depending on how the exchange views the volatility of that commodity. For example, when gold was trading wildly at a price of more than $700 per ounce, gold futures had a larger daily trading limit than they do at more stable levels of $300 to $400 an ounce (the current limit is a $15 move per day). If a commodity reaches its limit repeatedly for two or three days in a row, the exchange will usually increase the limit to allow for more price movement. The Chicago Board of Trade automatically increases limits by 50% if a futures contract trades at the limit three days in a row.

Whenever limits exist there is always the possibility that they can totally destroy the liquidity of a market. The actual commodity underlying the futures contract is called the "spot" and trades at the "spot price." The spot trades without a limit, of course. Thus, it is possible that the spot commodity can increase in price tremendously while the futures contract can only advance the daily limit each day. This scenario means that the futures could trade "up or down the limit" for a number of days in a row. As a consequence, no one would want to sell the futures if they were trading up the limit, since the spot was much higher. In those cases there is no trading in the futures – they are merely quoted as bid up the limit and no trades take place. This is disastrous for short sellers. They may be wiped out without ever having the chance to close out their positions. This sometimes happens to orange juice futures when an unexpected severe freeze hits Florida. Options can help alleviate the illiquidity caused by limit moves. That topic is covered later in this chapter.

DELIVERY

Futures on physical commodities can be assigned, much like stock options can be assigned. When a futures contract is assigned, the buyer of the contract is called upon to receive the full contract. Delivery is at the seller's option, meaning that the owner of the contract is informed that he must take delivery. Thus, if a corn contract is assigned, one is forced to receive 5,000 bushels of corn. The old adage about this being dumped in your yard is untrue. One merely receives a warehouse receipt and

is charged for storage. His broker makes the actual arrangements. Futures contracts cannot be assigned at any time during their life, as options can. Rather, there is a short period of time before they expire during which one can take delivery. This is generally a 4- to 6-week period and is called the "notice period" – the time during which one can be notified to accept delivery. The first day upon which the futures contract may be assigned is called the "first notice day," for logical reasons. Speculators close out their positions before the first notice day, leaving the rest of the trading up to the hedgers. Such considerations are not necessary for cash-based futures contracts (the index futures), since there is no physical commodity involved.

It is always possible to make a mistake, of course, and receive an assignment when you didn't intend to. Your broker will normally be able to reverse the trade for you, but it will cost you the warehouse fees and generally at least one commission.

The terms of the futures contract specify exactly what quantity of the commodity must be delivered, and also specify what form it must be in. Normally this is straightforward, as is the case with gold futures: That contract calls for delivery of 100 troy ounces of gold that is at least 0.995 fine, cast either in one bar or in three one-kilogram bars.

However, in some cases, the commodity necessary for delivery is more complicated, as is the case with Treasury bond futures. The futures contract is stated in terms of a nominal 8% interest rate. However, at any time, it is likely that the prevailing interest rate for long-term Treasury bonds will not be 8%. Therefore, the delivery terms of the futures contract allow for delivery of bonds with other interest rates.

Notice that the delivery is at the seller's option. Thus, if one is short the futures and doesn't realize that first notice day has passed, he has no problem, for delivery is under his control. It is only those traders holding long futures who may receive a surprise delivery notice.

One must be familiar with the specific terms of the contract and its methods of delivery if he expects to deal in the physical commodity. Such details on each futures contract are readily available from both the exchange and one's broker. However, most futures traders never receive or deliver the physical commodity; they close out their futures contracts before the time at which they can be called upon to make delivery.

PRICING OF FUTURES

It is beyond the scope of this book to describe futures arbitrage versus the cash commodity. Suffice it to say that this arbitrage is done, more in some markets (U.S. Treasury bonds, for example) than others (soybeans). Therefore, futures can be over-

priced or underpriced as well. The arbitrage possibilities would be calculated in a manner similar to that described for index futures, the futures premium versus cash being the determining factor.

OPTIONS ON FUTURES

The reader is somewhat familiar with options on futures, having seen many examples of index futures options. The commercial use of the option is to lock in a worst-case price as opposed to a future price. The U.S. businessman from the earlier example sold Swiss franc futures to lock in a future price. However, he might decide instead to buy Swiss franc futures put options to hedge his downside risk, but still leave room for upside profits if the currency markets move in his favor.

DESCRIPTION

A futures option is an option on the futures contract, not on the cash commodity. Thus, if one exercises or assigns a futures option, he buys or sells the futures contract. The options are always for one contract of the underlying commodity. Splits and adjustments do not apply in the futures markets as they do for stock options. Futures options generally trade in the same denominations as the future itself (there are a few exceptions to this rule, such as the T-bond options, which trade in sixty-fourths while the futures trade in thirty-seconds).

Example: Soybean options will be used to illustrate the above features of futures options.

Suppose that March soybeans are selling at 575.

Soybean quotes are in cents. Thus, 575 is \$5.75 – soybeans cost \$5.75 per bushel. A soybean contract is for 5,000 bushels of soybeans, so a one-cent move is worth \$50 (5,000 × .01).

Suppose the following option prices exist. The dollar cost of the options is also shown (one cent is worth \$50).

Option	Price	Dollar Cost
March 525 put	5	\$ 250
March 550 call	35½	\$1,775
March 600 call	8¼	\$ 412.50

The actual dollar cost is not necessary for the option strategist to determine the profitability of a certain strategy. For example, if one buys the March 600 call, he

needs March soybean futures to be trading at 608.25 or higher at expiration in order to have a profit at that time. This is the normal way in which a call buyer views his break-even point at expiration: strike price plus cost of the call. It is not necessary to know that soybean options are worth $50 per point in order to know that 608.25 is the break-even price at expiration.

If the future is a cash settlement future (Eurodollar, S&P 500, and other indices), then the options and futures generally expire simultaneously at the end of trading on the last trading day. (Actually, the S&P's expire on the next morning's opening.) However, options on physical futures will expire before the first notice day of the actual futures contract, in order to give traders time to close out their positions before receiving a delivery notice. The fact that the option expires in advance of the expiration of the underlying future has a slightly odd effect: The option often expires in the month preceding the month used to describe it.

Example: Options on March soybean futures are referred to as "March options." They do not actually expire in March – however, the soybean *futures* do.

The rather arcane definition of the last trading day for soybean options is "the last Friday preceding the last business day of the month prior to the contract month by at least 5 business days"!

Thus, the March soybean options actually expire in February. Assume that the last Friday of February is the 23rd. If there is no holiday during the business week of February 19th to 23rd, then the soybean options will expire on Friday, February 16th, which is 5 business days before the last Friday of February.

However, if President's Day happened to fall on Monday, February 19th, then there would only be four business days during the week of the 19th to the 23rd, so the options would have to expire one Friday earlier, on February 9th.

Not too simple, right? The best thing to do is to have a futures and options expiration calendar that one can refer to. *Futures Magazine* publishes a yearly calendar in its December issue, annually, as well as monthly calendars which are published each month of the year. Alternatively, your broker should be able to provide you with the information.

In any case, the March soybean futures options expire in February, well in advance of the first notice day for March soybeans, which is the last business day of the month preceding the expiration month (February 28th in this case). The futures option trader must be careful not to assume that there is a long time between option expiration and first notice day of the futures contract. In certain commodities, the futures first notice day is the day after the options expire (live cattle futures, for example).

Thus, *if one is long calls or short puts and, therefore, acquires a long futures contract via exercise or assignment, respectively, he should be aware of when the first notice day of the futures is; he could receive a delivery notice on his long futures position unexpectedly if he is not paying attention.*

OTHER TERMS

Striking Price Intervals. Just as futures on differing physical commodities have differing terms, so do options on those futures. Striking price intervals are a prime example. Some options have striking prices 5 points apart, while others have strikes only 1 point apart, reflecting the volatility of the futures contract. Specifically, S&P 500 options have striking prices 5 points apart, while soybean options striking prices are 25 points (25 cents) apart, and gold options are 10 points ($10) apart. Moreover, as is often the case with stocks, the striking price differential for a particular commodity may change if the price of the commodity itself is vastly different.

Example: Gold is quoted in dollars per ounce. Depending on the price of the futures contract, the striking price interval may be changed. The current rules are:

Striking Price Interval	Price of Futures
$10	below $500/oz.
$20	between $500 and $1,000/oz.
$50	above $1,000/oz.

Thus, when gold futures are more expensive, the striking prices are further apart. Note that gold has never traded above $1,000/oz., but the option exchanges are all set if it does.

This variability in the striking prices is common for many commodities. In fact, some commodities alter the striking price interval depending on how much time is remaining until expiration, possibly in addition to the actual prices of the futures themselves.

Realizing that the striking price intervals may change – that is, that new strikes will be added when the contract nears maturity – may help to plan some strategies, as it will give more choices to the strategist as to which options he can use to hedge or adjust his position.

Automatic Exercise. All futures options are subject to automatic exercise as are stock options. In general, a futures option will be exercised automatically, even if it is

one tick in the money. You can give instructions to *not* have a futures option automatically exercised if you wish.

SERIAL OPTIONS

Serial options are futures options whose expiration month is not the same as the expiration month of their corresponding underlying futures.

Example: Gold futures expire in February, April, June, August, October, and December. There are options that expire in those months as well. Notice that these expirations are spaced two months apart. Thus, when one gold contract expires, there are two months remaining until the next one expires.

Most option traders recognize that the heaviest activity in an option series is in the nearest-term option. If the nearest-term option has two months remaining until expiration, it will not draw the trading interest that a shorter-term option would.

Recognizing this fact, the exchange has decided that *in addition to the regular expiration, there will be an option contract that expires in the nearest non-cycle month,* that is, in the nearest month that does not have an actual gold future expiring. So, if it were currently January 1, there might be gold options expiring in February, March, April, etc.

Thus, the March option would be a *serial option.* There is no actual March gold future. Rather, the March options would be exercisable into April futures.

Serial options are exercisable into the nearest actual futures contract that exists after the options' expiration date. The number of serial option expirations depends on the underlying commodity. For example, gold will always have at least one serial option trading, per the definition highlighted in the example above. Certain futures whose expirations are three months apart (S&P 500 and all currency options) have serial options for the nearest two months that are not represented by an actual futures contract. Sugar, on the other hand, has only one serial option expiration per year – in December – to span the gap that exists between the normal October and March sugar futures expirations.

Strategists trading in options that may have serial expirations should be careful in how they evaluate their strategies. For example, June S&P 500 futures options strategies can be planned with respect to where the underlying S&P 500 Index of stocks will be at expiration, for the June options are exercisable into the June futures, which settle at the same price as the Index itself on the last day of trading. However, if one is trading April S&P 500 options, he must plan his strategy on where the June futures contract is going to be trading at April expiration. The April options are exer-

cisable into the June futures at April expiration. Since the June futures contract will still have some time premium in it in April, the strategist cannot plan his strategy with respect to where the actual S&P 500 Index will be in April.

Example: The S&P 500 Stock Index (symbol SPX) is trading at 410.50. The following prices exist:

		Options	
Cash (SPX):	410.50	April 415 call:	5.00
June futures:	415.00	June 415 call:	10.00

If one buys the June 415 call for 10.00, he knows that the SPX Index will have to rise to 425.00 in order for his call purchase to break even at June expiration. Since the SPX is currently at 410.50, a rise of 14.50 by the cash index itself will be necessary for break-even at June expiration.

However, a similar analysis will not work for calculating the break-even price for the April 415 call at April expiration. Since 5.00 points are being paid for the 415 call, the break-even at April expiration is 420. But exactly what needs to be at 420? The June future, since that is what the April calls are exercisable into.

Currently, the June futures are trading at a premium of 4.50 to the cash index (415.00 – 410.50). However, by April expiration, the fair value of that premium will have shrunk. Suppose that fair value is projected to be 3.50 premium at April expiration. Then the SPX would have to be at 416.50 in order for the June futures to be fairly valued at 420.00 (416.50 + 3.50 = 420.00).

Consequently, the SPX cash index would have to rise 6 points, from 410.50 to 416.50, in order for the June futures to trade at 420 at April expiration. If this happened, the April 415 call purchase would break even at expiration.

Quote symbols for futures options have improved greatly over the years. Most vendors use the convenient method of stating the striking price as a numeric number. The only "code" that is required is that of the expiration month. The codes for futures and futures options expiration months are shown in Table 34-1. Thus, a March (2002) soybean 600 call would use a symbol that is something like SH2C600, where S is the symbol for soybeans, H is the symbol for March, 2 means 2002, C stands for call option, and 600 is the striking price. This is a lot simpler and more flexible than stock options. There is no need for assigning striking prices to letters of the alphabet, as stocks do, to everyone's great consternation and confusion.

TABLE 34-1.
Month symbols for futures or futures options.

Futures or Futures Options Expiration Month	Month Symbol
January	F
February	G
March	H
April	J
May	K
June	M
July	N
August	Q
September	U
October	V
November	X
December	Z

Bid-Offer Spread. The actual markets – bids and offers – for most futures options are not generally available from quote vendors (options traded on the Chicago Merc are usually a pleasant exception). The same is true for futures contracts themselves. One can always request a market from the trading floor, but that is a time-consuming process and is impractical if one is attempting to analyze a large number of options. Strategists who are used to dealing in stock or index options will find this to be a major inconvenience. The situation has persisted for years and shows no sign of improving.

Commissions. Futures traders generally pay a commission only on the closing side of a trade. If a speculator first buys gold futures, he pays no commission at that time. Later, when he sells what he is long – closes his position – he is charged a commission. This is referred to as a "round-turn" commission, for obvious reasons. Many futures brokerage firms treat future options the same way – with a round-turn commission. Stock option traders are used to paying a commission on every buy and sell, and there are still a few futures option brokers who treat futures options that way, too. This is an important difference. Consider the following example.

Example: A futures option trader has been paying a commission of $15 per side – that is, he pays a commission of $15 per contract each time he buys and sells. His bro-

ker informs him one day that they are going to charge him $30 per *round turn,* payable up front, rather than $15 per side. That is the way most futures option brokerage firms charge their commissions these days. Is this the same thing, $15 per side or $30 round turn, paid up front? *No, it is not!* What happens if you buy an option and it expires worthless? You have already paid the commission for a trade that, in effect, never took place. Nevertheless, there is little you can do about it, for it has become the industry standard to charge round-turn commission on futures options.

In either case, commissions are negotiated to a flat rate by many traders. Discount futures commission merchants (i.e., brokerage houses) often attract business this way. In general, this method of paying commissions is to the customer's benefit. However, it does have a hidden effect that the option trader should pay attention to. This effect makes it potentially more profitable to trade options on some futures than on others.

Example: A customer who buys corn futures pays $30 per round turn in option commissions. Since corn options are worth $50 per one point (one cent), he is paying 0.60 of a point every time he trades a corn option (30/50 = 0.60).

Now, consider the same customer trading options on the S&P 500 futures. The S&P 500 futures and options are worth $250 per point. So, he is paying only 0.12 of a point to trade S&P 500 options (30/250 = .12).

He clearly stands a much better chance of making money in an S&P 500 option than he does in a corn option. He could buy an S&P option at 5.00 and sell it at 5.20 and make .08 points profit. However, with corn options, if he buys an option at 5, he needs to sell it at $5\frac{5}{8}$ to make money – a substantial difference between the two contracts. In fact, if he is participating in spread strategies and trading many options, the differential is even more important.

Position limits exist for futures options. While the limits for financial futures are generally large, other futures – especially agricultural ones – may have small limits. A large speculator who is doing spreads might inadvertently exceed a smaller limit. Therefore, one should check with his broker for exact limits in the various futures options before acquiring a large position.

OPTION MARGINS

Futures option margin requirements are generally more logical than equity or index option requirements. For example, if one has a conversion or reversal arbitrage in place, his requirement would be nearly zero for futures options, while it could be quite large for equity options. Moreover, futures exchanges have introduced a better way of margining futures and futures option portfolios.

SPAN Margin. The SPAN margin system (Standard Portfolio ANalysis of Risk) is used by nearly all of the exchanges. SPAN is designed to determine the entire risk of a portfolio, including all futures and options. It is a unique system in that it bases the option requirements on projected movements in the futures contracts as well as on potential changes in implied volatility of the options in one's portfolio. This creates a more realistic measure of the risk than the somewhat arbitrary requirements that were previously used (called the "customer margin" system) or than those used for stock and index options.

Not all futures clearing firms automatically put their customers on SPAN margin. Some use the older customer margin system for most of their option accounts. As a strategist, it would be beneficial to be under SPAN margin. Thus, one should deal with a broker who will grant SPAN margin.

The main advantages of SPAN margin to the strategist are twofold. First, naked option margin requirements are generally less; second, certain long option requirements are reduced as well. This second point may seem somewhat unusual – margin on long options? SPAN calculates the amount of a long option's value that is at risk for the current day. Obviously, if there is time remaining until expiration, a call option will still have some value even if the underlying futures trade down the limit. SPAN attempts to calculate this remaining value. If that value is less than the market price of the option, the excess can be applied toward any other requirement in the portfolio! Obviously, in-the-money options would have a greater excess value under this system.

How SPAN Works. Certain basic requirements are determined by the futures exchange, such as the amount of movement by the futures contract that must be margined (maintenance margin). Once that is known, the exchange's computers generate an array of potential gains and losses for the next day's trading, based on futures movement within a range of prices and based on volatility changes. These results are stored in a "risk array." There is a different risk array generated for each futures contract and each option contract. The clearing member (your broker) or you do not have to do any calculations other than to see how the quantities of futures and options in your portfolio are affected under the gains or losses in the SPAN risk array. The exchange does all the mathematical calculations needed to project the potential gains or losses. The results of those calculations are presented in the risk array.

There are 16 items in the risk array: For seven different futures prices, SPAN projects a gain or loss for both increased and decreased volatility; that makes 14 items. SPAN also projects a profit or loss for an "extreme" upward move and an "extreme" downward move. The futures exchange determines the exact definition of "extreme," and defines "increased" or "decreased" volatility.

SPAN "margin" applies to futures contracts as well, although volatility considerations don't mean anything in terms of evaluating the actual futures risk. As a first example, consider how SPAN would evaluate the risk of a futures contract.

Example: The S&P 500 futures will be used for this example. Suppose that the Chicago Mercantile Exchange determines that the required maintenance margin for the futures is $10,000, which represents a 20-point move by the futures (recall that S&P futures are worth $500 per point). Moreover, the exchange determines that an "extreme" move is 14 points, or $7,000 of risk.

Scenario	Long 1 Future Potential Pft/Loss
Futures unchanged; volatility up	0
Futures unchanged; volatility down	0
Futures up one-third of range; volatility up	+ 3,330
Futures up one-third of range; volatility down	+ 3,330
Futures down one-third of range; volatility up	− 3,330
Futures down one-third of range; volatility down	− 3,330
Futures up two-thirds of range; volatility up	+ 6,670
Futures up two-thirds of range; volatility down	+ 6,670
Futures down two-thirds of range; volatility up	− 6,670
Futures down two-thirds of range; volatility down	− 6,670
Futures up three-thirds of range; volatility up	+ 10,000
Futures up three-thirds of range; volatility down	+ 10,000
Futures down three-thirds of range; volatility up	**−10,000**
Futures down three-thirds of range; volatility down	− 10,000
Futures up "extreme" move	+ 7,000
Futures down "extreme" move	− 7,000

The 16 array items are always displayed in this order. Note that since this array is for a futures contract, the "volatility up" and "volatility down" scenarios are always the same, since the volatility that is referred to is the one that is used as the input to an option pricing model.

Notice that the actual price of the futures contract is not needed in order to generate the risk array. *The SPAN requirement is always the largest potential loss from the array.* Thus, if one were long one S&P 500 futures contract, his SPAN margin requirement would be $10,000, which occurs under the "futures down three-thirds" scenarios. This will always be the maintenance margin for a futures contract.

Now let us consider an option example. In this type of calculation, the exchange uses the same moves by the underlying futures contract and calculates the option theoretical values as they would exist on the next trading day. One calculation is performed for volatility increasing and one for volatility decreasing.

Example: Using the same S&P 500 futures contract, the following array might depict the risk array for a long December 410 call. One does not need to know the option or futures price in order to use the array; the exchange incorporates that information into the model used to generate the potential gains and losses.

Scenario	Long 1 Dec 410 call Potential Pft/Loss
Futures unchanged; volatility up	+ 460
Futures unchanged; volatility down	– 610
Futures up one-third of range; volatility up	+ 2,640
Futures up one-third of range; volatility down	+ 1,730
Futures down one-third of range; volatility up	– 1,270
Futures down one-third of range; volatility down	– 2,340
Futures up two-thirds of range; volatility up	+ 5,210
Futures up two-thirds of range; volatility down	+ 4,540
Futures down two-thirds of range; volatility up	– 2,540
Futures down two-thirds of range; volatility down	– 3,430
Futures up three-thirds of range; volatility up	+ 8,060
Futures up three-thirds of range; volatility down	+ 7,640
Futures down three-thirds of range; volatility up	– 3,380
Futures down three-thirds of range; volatility down	**– 3,990**
Futures up "extreme" move	+ 3,130
Futures down "extreme" move	– 1,500

The items in the risk array are all quite logical: Upward futures movements produce profits and downward futures movements produce losses in the long call position. Moreover, worse results are always obtained by using the lower volatility as opposed to the higher one. In this particular example, the SPAN requirement would be $3,990 ("futures down three-thirds; volatility down"). That is, the SPAN system predicts that you could lose $3,990 of your call value if futures fell by their entire range and volatility decreased – a worst-case scenario. Therefore, that is the amount of margin one is required to keep for this long option position.

While the exchange does not tell us how much of an increase or decrease it uses in terms of volatility, one can get something of a feel for the magnitude by looking at the first two lines of the table. The exchange is saying that if the futures are unchanged tomorrow, but volatility "increases," then the call will increase in value by $460 (92 cents); if it "decreases," however, the call will lose $610 (1.22 points) of value. These are large price changes, so one can assume that the volatility assumptions are significant.

The real ease of use of the SPAN risk array is when it comes to evaluating the risk of a more complicated position, or even a portfolio of options. All one needs to do is to combine the risk array factors for each option or future in the position in order to arrive at the total requirement.

Example: Using the above two examples, one can see what the SPAN requirements would be for a covered write: long the S&P future and short the Dec 410 call.

Scenario	Long 1 S&P Future	Short 1 Dec 410 call Potential Pft/Loss	Covered Write
Futures unchanged; vol. up	0	– 460	– 460
Futures unchanged; vol. down	0	+ 610	+ 610
Futures up 1/3 of range; vol. up	+ 3,330	– 2,640	+ 690
Futures up 1/3 of range; vol. down	+ 3,330	– 1,730	+1,600
Futures down 1/3 of range; vol. up	– 3,330	+ 1,270	–2,060
Futures down 1/3 of range; vol. down	– 3,330	+ 2,340	– 990
Futures up 2/3 of range; vol. up	+ 6,670	– 5,210	+1,460
Futures up 2/3 of range; vol. down	+ 6,670	– 4,540	+2,130
Futures down 2/3 of range; vol. up	– 6,670	+ 2,540	–4,130
Futures down 2/3 of range; vol. down	– 6,670	+ 3,430	–3,240
Futures up 3/3 of range; vol. up	+10,000	– 8,060	+1,940
Futures up 3/3 of range; vol. down	+10,000	– 7,640	+2,360
Futures down 3/3 of range; vol. up	**–10,000**	**+ 3,380**	**–6,620**
Futures down 3/3 of range; vol. down	–10,000	+ 3,990	–6,010
Futures up "extreme" move	+ 7,000	– 3,130	+3,870
Futures down "extreme" move	– 7,000	+ 1,500	–5,500

As might be expected, the worst-case projection for a covered write is for the stock to drop, but for the implied volatility to increase. The SPAN system projects that this covered writer would lose $6,620 if that happened. Thus, "futures down 3/3 of range; volatility up" is the SPAN requirement, $6,620.

As a means of comparison, under the older "customer margin" option requirements, the requirement for a covered write was the futures margin, plus the option premium, less one-half the out-of-the-money amount. In the above example, assume the futures were at 408 and the call was trading at 8. The customer covered write margin would then be more than twice the SPAN requirement:

Futures margin	$10,000
Option premium	+ 4,000
1/2 out-of-money amount	− 1,000
	$13,000

Obviously, one can alter the quantities in the use of the risk array quite easily. For example, if he had a ratio write of long 3 futures and short 5 December 410 calls, he could easily calculate the SPAN requirement by multiplying the projected futures gains and losses by 3, multiplying the projected option gains and losses by 5, and adding the two together to obtain the total requirement. Once he had completed this calculation, his SPAN requirement would be the worst expected loss as projected by SPAN for the next trading day.

In actual practice, the SPAN calculations are even more sophisticated: They take into account a certain minimum option margin (for deeply out-of-the-money options); they account for spreads between futures contracts on the same commodity (different expiration months); they add a delivery month charge (if you are holding a position past the first notice day); and they even allow for slightly reduced requirements for related, but different, futures spreads (T-bills versus T-bonds, for example).

If you are interested in calculating SPAN margin yourself, your broker may be able to provide you with the software to do so. More likely, though, he will provide the service of calculating the SPAN margin on a position prior to your establishing it. The details for obtaining the SPAN margin requirements should thus be requested from your broker.

PHYSICAL CURRENCY OPTIONS

Another group of listed options on a physical is the currency options that trade on the Philadelphia Stock Exchange (PHLX). In addition, there is an even larger over-the-counter market in foreign currency options. Since the physical commodity underlying the option is currency, in some sense of the word, these are cash-based options as well. However, the cash that the options are based in is not dollars, but rather may be deutsche marks, Swiss francs, British pounds, Canadian dollars, French francs, or

Japanese yen. Futures trade in these same currencies on the Chicago Mercantile Exchange. Hence, many traders of the physical options use the Chicago-based futures as a hedge for their positions.

Unlike stock options, currency options do not have standardized terms – the amount of currency underlying the option contract is not the same in each of the cases. The striking price intervals and units of trading are not the same either. However, since there are only the six different contracts and since their terms correspond to the details of the futures contracts, these options have had much success. The foreign currency markets are some of the largest in the world, and that size is reflected in the liquidity of the futures on these currencies.

The Swiss franc contract will be used to illustrate the workings of the foreign currency options. The other types of foreign currency options work in a similar manner, although they are for differing amounts of foreign currency. The amount of foreign currency controlled by the foreign currency contract is the unit of trading, just as 100 shares of stock is the unit of trading for stock options. The unit of trading for the Swiss franc option on the PHLX is 62,500 Swiss francs. Normally, the currency itself is quoted in terms of U.S. dollars. For example, a Swiss franc quote of 0.50 would mean that one Swiss franc is worth 50 cents in U.S. currency.

Note that when one takes a position in foreign currency options (or futures), he is simultaneously taking an opposite position in U.S. dollars. That is, if one owns a Swiss franc call, he is long the franc (at least delta long) and is by implication therefore short U.S. dollars.

Striking prices in Swiss options are assigned in one-cent increments and are stated in cents, not dollars. That is, if the Swiss franc is trading at 50 cents, then there might be striking prices of 48, 49, 50, 51, and 52. Given the unit of trading and the striking price in U.S. dollars, one can compute the total dollars involved in a foreign currency exercise or assignment.

Example: Suppose the Swiss franc is trading at 0.50 and there are striking prices of 48, 50, and 52, representing U.S. cents per Swiss franc. If one were to exercise a call with a strike of 48, then the dollars involved in the exercise would be 125,000 (the unit of trading) times 0.48 (the strike in U.S. dollars), or $60,000.

Option premiums are stated in U.S. cents. That is, if a Swiss franc option is quoted at 0.75, its cost is $.0075 times the unit of trading, 125,000, for a total of $937.50. Premiums are quoted in hundredths of a point. That is, the next "tick" from 0.75 would be 0.76. Thus, for the Swiss franc options, each tick or hundredth of a point is equal to $12.50 (.0001 × 125,000).

Actual delivery of the security to satisfy an assignment notice must occur within the country of origin. That is, the seller of the currency must make arrangements to deliver the currency in its country of origin. On exercise or assignment, sellers of currency would be put holders who exercise or call writers who are assigned. Thus, if one were short Swiss franc calls and he were assigned, he would have to deliver Swiss francs into a bank in Switzerland. This essentially means that there have to be agreements between your firm or your broker and foreign banks if you expect to exercise or be assigned. The actual payment for the exercise or assignment takes place between the broker and the Options Clearing Corporation (OCC) in U.S. dollars. The OCC then can receive or deliver the currency in its country of origin, since OCC has arrangements with banks in each country.

EXERCISE AND ASSIGNMENT

The currency options that trade on the PHLX (Philadelphia Exchange) have exercise privileges similar to those for all other options that we have studied: They can be exercised at any time during their life.

Even though PHLX currency options are "cash" options in the most literal sense of the word, they do not expose the writer to the same risks of early assignment that cash-based index options do.

Example: Suppose that a currency trader has established the following spread on the PHLX: long Swiss franc December 50 puts, short Swiss franc December 52 puts – a bullish spread. As in any one-to-one spread, there is limited risk. However, the dollar rallies and the Swiss franc falls, pushing the exchange rate down to 48 cents (U.S.) per Swiss franc. Now the puts that were written – the December 52 contracts – are deeply in-the-money and might be subject to early assignment, as would any deeply in-the-money put if it were trading at a discount.

Suppose the trader learns that he has indeed been assigned on his short puts. He still has a hedge, for he is long the December 50 puts and he is now long Swiss francs. This is still a hedged position, and he still has the same limited risk as he did when he started (plus possibly some costs involved in taking physical delivery of the francs). This situation is essentially the same as that of a spreader in stock or futures options, who would still be hedged after an assignment because he would have acquired the stock or future. Contrast this to the cash-based index option, in which there is no longer a hedge after an assignment.

FUTURES OPTION TRADING STRATEGIES

The strategies described here are those that are unique to futures option trading. Although there may be some general relationships to stock and index option strategies, for the most part these strategies apply only to futures options. It will also be shown – in the backspread and ratio spread examples – that one can compute the profitability of an option spread in the same manner, no matter what the underlying instrument is (stocks, futures, etc.) by breaking everything down into "points" and not "dollars."

Before getting into specific strategies, it might prove useful to observe some relationships about futures options and their price relationships to each other and to the futures contract itself. Carrying cost and dividends are built into the price of stock and index options, because the underlying instrument pays dividends and one has to pay cash to buy or sell the stock. Such is not the case with futures. The "investment" required to buy a futures contract is not initially a cash outlay. Note that the cost of carry associated with futures generally refers to the carrying cost of owning the cash commodity itself. That carrying cost has no bearing on the price of a futures option other than to determine the futures price itself. Moreover, the future has no dividends or similar payout. This is even true for something like U.S. Treasury bond options, because the interest rate payout of the cash bond is built into the futures price; thus, the option, which is based on the futures price and not directly on the cash price, does not have to allow for carry, since the future itself has no initial carrying costs associated with it.

Simplistically, it can be stated that:

Futures Call = Futures Put + Futures Price – Strike Price

Example: April crude oil futures closed at 18.74 ($18.74 per barrel). The following prices exist:

Strike Price	April Call Price	April Put Price	Put + Futures – Strike
17	1.80	0.06	1.80
18	0.96	0.22	0.96
19	0.35	0.61	0.35
20	0.10	1.36	0.10

Note that, at every strike, the above formula is true (Call = Put + Futures – Strike). These are not theoretical prices; they were taken from actual settlement prices on a particular trading day.

In reality, where deeply in-the-money or longer-term options are involved, this simple formula is not correct. However, for most options on a particular nearby futures contract, it will suffice quite well. Examine the quotes in today's newspaper to verify that this is a true statement.

A subcase of this observation is that *when the futures contract is exactly at the striking price, the call and put with that strike will both trade at the same price.* Note that in the above formula, if one sets the futures price equal to the striking price, the last two terms cancel out and one is left with: Call price = Put price.

One final observation before getting into strategies: For a put and a call with the same strike,

$$\text{Net change call} - \text{Net change put} = \text{Net change futures}$$

This is a true statement for stock and index options as well, and is a useful rule to remember. Since futures options bid and offer quotes are not always disseminated by quote vendors, one is forced to use last sales. If the last sales don't conform to the rule above, then at least one of the last sales is probably not representative of the true market in the options.

Example: April crude oil is up 50 cents to 19.24. A trader punches up the following quotes on his machine and sees the following prices:

Option	Last Sale	Net Change
April 19 call:	0.55	+ 0.20
April 19 put:	0.31	− 0.30

These options conform to the above rule:

$$\begin{aligned}\text{Net change futures} &= \text{Net change call} - \text{Net change put}\\ &= +0.20 - (-0.30)\\ &= +0.50\end{aligned}$$

The net changes of the call and put indicate the April future should be up 50 cents, which it is.

Suppose that one also priced a less active option on his quote machine and saw the following:

Option	Last Sale	Net Change
April 17 call:	2.10	+ 0.30
April 17 put:	0.04	− 0.02

In this case, the formula yields an incorrect result:

$$\text{Net change futures} = +0.30 - (-0.02) = +0.32$$

Since the futures are really up 50 cents, one can assume that one of the last sales is out of date. It is obviously the April 17 call, since that is the in-the-money option; if one were to ask for a quote from the trading floor, that option would probably be indicated up about 48 cents on the day.

DELTA

While we are on the subject of pricing, a word about delta may be in order as well. The delta of a futures option has the same meaning as the delta of a stock option: It is the amount by which the option is expected to increase in price for a one-point move in the underlying futures contract. As we also know, it is an instantaneous measurement that is obtained by taking the first derivative of the option pricing model.

In any case, the delta of an at-the-money stock or index option is greater than 0.50; the more time remaining to expiration, the higher the delta is. In a simplified sense, this has to do with the cost of carrying the value of the striking price until the option expires. But part of it is also due to the distribution of stock price movements – there is an upward bias, and with a long time remaining until expiration, that bias makes call movements more pronounced than put movements.

Options on futures do not have the carrying cost feature to deal with, but they do have the positive bias in their price distribution. A futures contract, just like a stock, can increase by more than 100%, but cannot fall more than 100%. Consequently, deltas of at-the-money futures calls will be slightly larger than 0.50. The more time remaining until expiration of the futures option, the higher the at-the-money call delta will be.

Many traders erroneously believe that the delta of an at-the-money futures option is 0.50, since there is no carrying cost involved in the futures conversion or reversal arbitrage. That is not a true statement, since the distribution of futures prices affects the delta as well.

As always, for futures options as well as for stock and index options, *the delta of a put is related to the delta of a call with the same striking price and expiration date:*

$$\text{Delta of put} = 1 - \text{Delta of call}$$

Finally, the concept of equivalent stock position applies to futures option strategies, except, of course, it is called the *equivalent futures position* (EFP). The EFP is calculated by the simple formula:

$$\text{EFP} = \text{Delta of option} \times \text{Option quantity}$$

Thus, if one is long 8 calls with a delta of 0.75, then that position has an EFP of 6 (8×0.75). This means that being long those 8 calls is the same as being long 6 futures contracts.

Note that in the case of stocks, the equivalent stock position formula has another factor – shares per option. That concept does not apply to futures options, since they are always options on one futures contract.

MATHEMATICAL CONSIDERATIONS

This brief section discusses modeling considerations for futures options and options on physicals.

Futures Options. The Black model (see Chapter 33 on mathematical considerations for index options) is used to price futures options. Recall that futures don't pay dividends, so there is no dividend adjustment necessary for the model. In addition, there is no carrying cost involved with futures, so the only adjustment that one needs to make is to use 0% as the interest rate input to the Black–Scholes model. This is an oversimplification, especially for deeply in-the-money options. One is tying up some money in order to buy an option. Hence, the Black model will discount the price from the Black–Scholes model price. Therefore, the actual pricing model to be used for theoretical evaluation of futures options is the Black model, which is merely the Black–Scholes model, using 0% as the interest rate, and then discounted:

$$\text{Call Theoretical Price} = e^{-rt} \times \text{Black–Scholes formula } [r = 0]$$

Recall that it was stated above that:

$$\text{Futures call} = \text{Futures put} + \text{Future price} - \text{Strike price}$$

The actual relationship is:

$$\text{Futures call} = \text{Futures put} + e^{-rt}\,(\text{Futures price} - \text{Strike price})$$

where

r = the short-term interest rate,

t = the time to expiration in years, and

e^{-rt} = the discounting factor.

The short-term interest rate has to be used here because when one pays a debit for an option, he is theoretically losing the interest that he could earn if he had that money in the bank instead, earning money at the short-term interest rate.

The difference between these two formulae is so small for nearby options that are not deeply in-the-money that it is normally less than the bid–asked spread in the options, and the first equation can be used.

Example: The table below compares the theoretical values computed with the two formulae, where $r = 6\%$ and $t = 0.25$ (1/4 of a year). Furthermore, assume the futures price is 100. The strike price is given in the first column, and the put price is given in the second column. The predicted call prices according to each formula are then shown in the next two columns.

Strike	Put Price	Formula 1 (Simple)	Formula 2 (Using e^{-rt})
70	0.25	30.25	29.80
80	1.00	21.00	20.70
90	3.25	13.25	13.10
95	5.35	10.35	10.28
100	7.50	7.50	7.50
105	10.70	5.70	5.77
110	13.90	3.90	4.05
120	21.80	1.80	2.10

For options that are 20 or 30 points in- or out-of-the-money, there is a noticeable differential in these three-month options. However, for options closer to the strike, the differential is small.

If the time remaining to expiration is shorter than that used in the example above, the differences are smaller; if the time is longer, the differences are magnified.

Options on Physicals. Determining the fair value of options on physicals such as currencies is more complicated. The proper way to calculate the fair value of an option on a physical is quite similar to that used for stock options. Recall that in the case of stock options, one first subtracts the present worth of the dividend from the current stock price before calculating the option value. A similar process is used for determining the fair value of currency or any other options on physicals. In any of these cases, the underlying security bears interest continuously, instead of quarterly as stocks do. Therefore, all one needs to do is to subtract from the underlying price the amount of interest to be paid until option expiration and then add the amount of accrued interest to be paid. All other inputs into the Black–Scholes model would remain the same, including the risk-free interest rate being equal to the 90-day T-bill rate.

Again, the practical option strategist has a shortcut available to him. If one assumes that the various factors necessary to price currencies have been assimilated into the futures markets in Chicago, then one can merely use the futures price as the price of the underlying for evaluating the physical delivery options in Philadelphia.

This will not work well near expiration, since the future expires one week prior to the PHLX option. In addition, it ignores the early exercise value of the PHLX options. However, except for these small differentials, the shortcut will give theoretical values that can be used in strategy-making decisions.

Example: It is sometime in April and one desires to calculate the theoretical values of the June deutsche mark physical delivery options in Philadelphia. Assume that one knows four of the basic items necessary for input to the Black–Scholes formula: 60 days to expiration, strike price of 68, interest rate of 10%, and volatility of 18%. But what should be used as the price of the underlying deutsche mark? Merely use the price of the June deutsche mark futures contract in Chicago.

STRATEGIES REGARDING TRADING LIMITS

The fact that trading limits exist in most futures contracts could be detrimental to both option buyers and option writers. At other times, however, the trading limit may present a unique opportunity. The following section focuses on who might benefit from trading limits in futures and who would not.

Recall that a trading limit in a futures contract limits the absolute number of points that the contract can trade up or down from the previous close. Thus, if the trading limit in T-bonds is 3 points and they closed last night at $74^{21}/_{32}$, then the highest they can trade on the next day is $77^{21}/_{32}$, regardless of what might be happening in the cash bond market. Trading limits exist in many futures contracts in order to help ensure that the market cannot be manipulated by someone forcing the price to move tremendously in one direction or the other. Another reason for having trading limits is ostensibly to allow only a fixed move, approximately equal to the amount covered by the initial margin, so that maintenance margin can be collected if need be. However, limits have been applied in cases in which they are unnecessary. For example, in T-bonds, there is too much liquidity for anyone to be able to manipulate the market. Moreover, it is relatively easy to arbitrage the T-bond futures contract against cash bonds. This also increases liquidity and would keep the future from trading at a price substantially different from its theoretical value.

Sometimes the markets actually *need* to move far quickly and cannot because of the trading limit. Perhaps cash bonds have rallied 4 points, when the limit is 3 points. This makes no difference – when a futures contract has risen as high as it can go for the day, it is bid there (a situation called "limit bid") and usually doesn't trade again as long as the underlying commodity moves higher. It is, of course, possible for a future to be limit bid, only to find that later in the day, the underlying commodity becomes weaker, and traders begin to sell the future, driving it down off the limit.

Similar situations can also occur on the downside, where, if the future has traded as low as it can go, it is said to be "limit offered."

As was pointed out earlier, futures *options* sometimes have trading limits imposed on them as well. This limit is of the same magnitude as the futures limit. Most of these are on the Chicago Board of Trade (all grains, U.S. Treasury bonds, Municipal Bond Index, Nikkei stock index, and silver), although currency options on the Chicago Merc are included as well. In other markets, options are free to trade, even though futures have effectively halted because they are up or down the limit. However, even in the situations in which futures options themselves have a trading limit, there may be out-of-the-money options available for trading that have not reached their trading limit.

When options are still trading, one can use them to imply the price at which the futures would be trading, were they not at their trading limit.

Example: August soybeans have been inflated in price due to drought fears, having closed on Friday at 650 ($6.50 per bushel). However, over the weekend it rains heavily in the Midwest, and it appears that the drought fears were overblown. Soybeans open down 30 cents, to 620, down the allowable 30-cent limit. Furthermore, there are no buyers at that level and the August bean contract is locked limit down. No further trading ensues.

One may be able to use the August soybean options as a price discovery mechanism to see where August soybeans would be trading if they were open.

Suppose that the following prices exist, even though August soybeans are not trading because they are locked limit down:

Option	Last Sale Price	Net Change for the Day
August 625 call	19	−21
August 625 put	31	+16

An option strategist knows that synthetic long futures can be created by buying a call and selling a put, or vice versa for short futures. Knowing this, one can tell what price futures are projected to be trading at:

$$\begin{aligned}\text{Implied Futures Price} &= \text{Strike Price} + \text{Call Price} - \text{Put Price}\\ &= 625 + 19 - 31 = 613\end{aligned}$$

With these options at the prices shown, one can create a synthetic futures position at a price of 613. Therefore, the implied price for August soybean futures in this example is 613.

Note that this formula is merely another version of the one previously presented in this chapter.

In the example above, neither of the options in question had moved the 30-point limit, which applies to soybean options as well as to soybean futures. If they had, they would not be useable in the formula for implying the price of the future. *Only options that are freely trading – not limit up or down – can be used in the above formula.*

A more complete look at soybean futures options on the day they opened and stayed down the limit would reveal that some of them are not tradeable either:

Example: Continuing the above example, August soybeans are locked limit down 30 cents on the day. The following list shows a wider array of option prices. Any option that is either up or down 30 cents on the day has also reached its trading limit, and therefore could not be used in the process necessary to discover the implied price of the August futures contract.

Option	Last Sale Price	Net Change for the Day
August 550 call	71	– 30
August 575 call	48	– 30
August 600 call	31	– 26
August 625 call	19	– 21
August 650 call	11	– 15
August 675 call	6	– 10
August 550 put	4	+ 3
August 575 put	9	+ 6
August 600 put	18	+ 11
August 625 put	31	+ 16
August 650 put	48	+ 22
August 675 put	67	+ 30

The deeply in-the-money calls, August 550's and August 575's, and the deeply in-the-money August 675 puts are all at the trading limit. All other options are freely trading and could be used for the above computation of the August future's implied price.

One may ask how the market-makers are able to create markets for the options when the future is not freely trading. They are pricing the options off cash quotes. Knowing the cash quote, they can imply the price of the future (613 in this case), and they can then make option markets as well.

The real value in being able to use the options when a future is locked limit up or limit down, of course, is to be able to hedge one's position. Simplistically, if a trader came in long the August soybean futures and they were locked limit down as in the example above, he could use the puts and calls to effectively close out his position.

Example: As before, August soybeans are at 620, locked down the limit of 30 cents. A trader has come into this trading day long the futures and he is very worried. He cannot liquidate his long position, and if soybeans should open down the limit again tomorrow, his account will be wiped out. He can use the August options to close out his position.

Recall that it has been shown that the following is true:

Long put + Short call is equivalent to short stock.

It is also equivalent to short futures, of course. So if this trader were to buy a put and short a call at the same strike, then he would have the equivalent of a short futures position to offset his long futures position.

Using the following prices, which are the same as before, one can see how his risk is limited to the effective futures price of 613. That is, buying the put and selling the call is the same as selling his futures out at 613, down 37 cents on the trading day.

Current prices:

Option	Last Sale Price	Net Change for the Day
August 625 call	19	−21
August 625 put	31	+16

Position:

Buy August 625 put for 19

Sell August 625 call for 31

August Futures at Option Expiration	Put Price	Put P/L	Call Price	Call P/L	Net Profit or Loss on Position
575	50	+ $1,900	0	+$1,900	+$3,800
600	25	− 600	0	+ 1,900	+ 1,300
613	12	− 1,900	0	+ 1,900	0
625	0	− 3,100	0	+ 1,900	− 1,200
650	0	− 3,100	25	− 600	− 3,700

This profit table shows that selling the August 625 call at 19 and buying the August 625 put at 31 is equivalent to – that is, it has the same profit potential as – selling the August future at 613. So, if one buys the put and sells the call, he will effectively have sold his future at 613 and taken his loss.

His resultant position after buying the put and selling the call would be a conversion (long futures, long put, and short call). The margin required for a conversion or reversal is zero in the futures market. The margin rules recognize the riskless nature of such a strategy. Thus, any excess money that he has after paying for the unrealized loss in the futures will be freed up for new trades.

The futures trader does not have to completely hedge off his position if he does not want to. He might decide to just buy a put to limit the downside risk. Unfortunately, to do so after the futures are already locked limit down may be too little, too late. There are many kinds of partial hedges that he could establish – buy some puts, sell some calls, utilize different strikes, etc.

The same or similar strategies could be used by a naked option seller who cannot hedge his position because it is up the limit. He could also utilize options that are still in free trading to create a synthetic futures position.

Futures options generally have enough out-of-the-money striking prices listed that some of them will still be free trading, even if the futures are up or down the limit. This fact is a boon to anyone who has a losing position that has moved the daily trading limit. Knowing how to use just this one option trading strategy should be a worthwhile benefit to many futures traders.

COMMONPLACE MISPRICING STRATEGIES

Futures options are sometimes prone to severe mispricing. Of course, any product's options may be subject to mispricing from time to time. However, it seems to appear in futures options more often than it does in stock options. The following discussion of strategies concentrates on a specific pattern of futures options mispricing that occurs with relative frequency. It generally manifests itself in that out-of-the-money puts are too cheap, and out-of-the-money calls are too expensive. The proper term for this phenomenon is "volatility skewing" and it is discussed further in Chapter 36 on advanced concepts. In this chapter, we concentrate on how to spot it and how to attempt to profit from it.

Occasionally, stock options exhibit this trait to a certain extent. Generally, it occurs in stocks when speculators have it in their minds that a stock is going to experience a sudden, substantial rise in price. They then bid up the out-of-the-money calls, particularly the near-term ones, as they attempt to capitalize on their bullish expectations. When takeover rumors abound, stock options display this mispricing

pattern. Mispricing is, of course, a statistically related term; it does not infer anything about the possible validity of takeover rumors.

A significant amount of discussion is going to be spent on this topic, because *the futures option trader will have ample opportunities to see and capitalize on this mispricing pattern;* it is not something that just comes along rarely. He should therefore be prepared to make it work to his advantage.

Example: January soybeans are trading at 583 ($5.83 per bushel). The following prices exist:

January beans: 583

Strike	Call Price	Put Price
525		1/2
550		3 1/4
575	19 1/2	12
600	11	28
625	5 1/4	
650	3 1/2	
675	2 1/4	

Suppose one knows that, according to historic patterns, the "fair values" of these options are the prices listed in the following table.

Strike	Call Price	Call Theo. Value	Put Price	Put Theo. Value
525			1/2	1.6
550			3 1/4	5.4
575	19 1/2	21.5	12	13.7
600	11	10.4	28	27.6
625	5 3/4	4.3		
650	3 1/2	1.5		
675	2 1/4	0.7		

Notice that the out-of-the-money puts are priced well below their theoretical value, while the out-of-the-money calls are priced above. The options at the 575 and 600 strikes are much closer in price to their theoretical values than are the out-of-the-money options.

There is another way to look at this data, and that is to view the options' implied volatility. Implied volatility was discussed in Chapter 28 on mathematical applications. It is basically the volatility that one would have to plug into his option pricing model in order for the model's theoretical price to agree with the actual market price. Alternatively, it is the volatility that is being implied by the actual marketplace. The options in this example each have different implied volatilities, since their mispricing is so distorted. Table 34-2 gives those implied volatilities. The deltas of the options involved are shown as well, for they will be used in later examples.

These implied volatilities tell the same story: The out-of-the-money puts have the lowest implied volatilities, and therefore are the cheapest options; the out-of-the-money calls have the highest implied volatilities, and are therefore the most expensive options.

So, no matter which way one prefers to look at it – through comparison of the option price to theoretical price or by comparing implied volatilities – it is obvious that these soybean options are out of line with one another.

This sort of pricing distortion is prevalent in many commodity options. Soybeans, sugar, coffee, gold, and silver are all subject to this distortion from time to time. The distortion is endemic to some – soybeans, for example – or may be present only when the speculators turn extremely bullish.

This precise mispricing pattern is so prevalent in futures options that strategists should constantly be looking for it. There are two major ways to attempt to profit from this pattern. Both are attractive strategies, since one is buying options that are relatively less expensive than the options that are being sold. Such strategies, if implemented when the options are mispriced, tilt the odds in the strategist's favor, creating a positive expected return for the position.

TABLE 34-2.
Volatility skewing of soybean options.

Strike	Call Price	Put Price	Implied Volatility	Delta Call/Put
525		1/2	12%	/−0.02
550		3 1/4	13%	/−0.16
575	19 1/2	12	15%	0.59/−0.41
600	11	28	17%	0.37/−0.63
625	5 3/4		19%	0.21
650	3 1/2		21%	0.13
675	2 1/4		23%	0.09

The two theoretically attractive strategies are:

1. Buy out-of-the-money puts and sell at-the-money puts; or
2. Buy at-the-money calls and sell out-of-the-money calls.

One might just buy one cheap and sell one expensive option – a bear spread with the puts, or a bull spread with the calls. However, it is better to implement these spreads with a ratio between the number of options bought and the number sold. That is, the first strategy involving puts would be a backspread, while the second strategy involving calls would be a ratio spread. By doing the ratio, each strategy is a more neutral one. Each strategy is examined separately.

BACKSPREADING THE PUTS

The backspread strategy works best when one expects a large degree of volatility. Implementing the strategy with puts means that a large drop in price by the underlying futures would be most profitable, although a limited profit could be made if futures rose. Note that a moderate drop in price by expiration would be the worst result for this spread.

Example: Using prices from the above example, suppose that one decides to establish a backspread in the puts. Assume that a neutral ratio is obtained in the following spread:

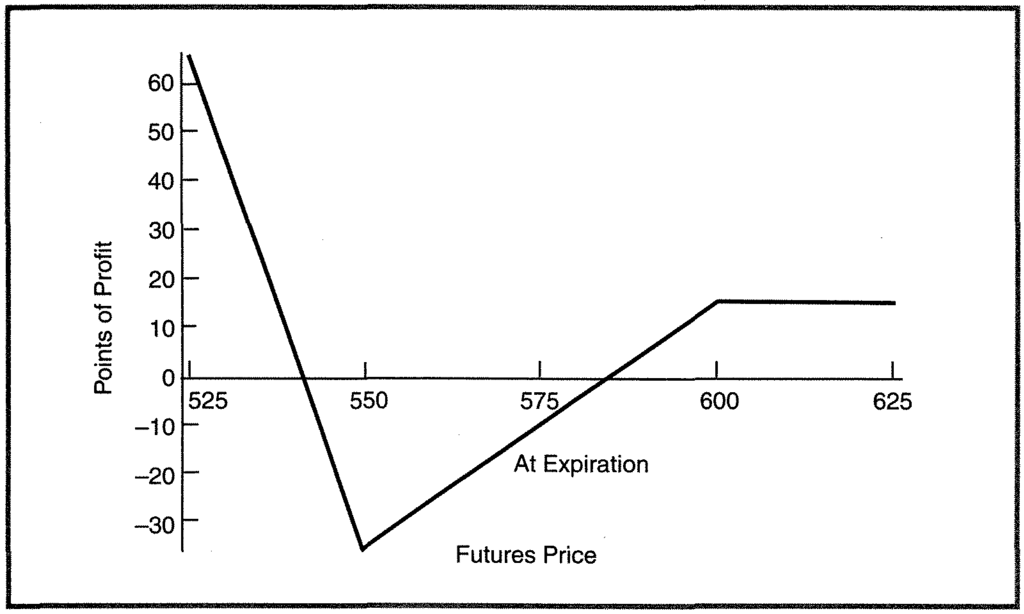
Buy 4 January bean 550 puts $3^1/_4$	13 DB
Sell 1 January bean 600 put at 28	28 CR
Net position:	15 Credit

The deltas (see Table 34-2) of the options are used to compute this neutral ratio.

Figure 34-1 shows the profit potential of this spread. It is the typical picture for a put backspread – limited upside potential with a great deal of profit potential for large downward moves. Note that the spread is initially established for a credit of 15 cents. If January soybeans have volatile movements in either direction, the position should profit. Obviously, the profit potential is larger to the downside, where there are extra long puts. However, if beans should rally instead, the spreader could still make up to 15 cents ($750), the initial credit of the position.

Note that one can treat the prices of soybean options in the same manner as he would treat the prices of stock options in order to determine such things as breakeven points and maximum profit potential. The fact that soybean options are worth

FIGURE 34-1.
January soybean, backspread.



$50 per point (which is *cents* when referring to soybeans) and stock options are worth $100 per point do not alter these calculations for a put backspread.

Maximum upside profit potential = Initial debit or credit of position
= 15 points

Maximum risk = Maximum upside – Distance between strikes × Number of puts sold short
= 15 – 50 × 1
= –35 points

Downside break-even point = Lower strike – Points of risk/Number of excess puts
= 550 – 35/3
= 538.3

Thus, one is able to analyze a futures option position or a stock option position in the same manner – by reducing everything to be in terms of points, not dollars. Obviously, one will eventually have to convert to dollars in order to calculate his profits or losses. However, note that referring to everything in "points" works very well.

Later, one can use the dollars per point to obtain actual dollar cost. Dollars per point would be \$50 for soybeans options, \$100 for stock or index options, \$400 for live cattle options, \$375 for coffee options, \$1,120 for sugar options, etc. In this way, one does not have to get hung up in the nomenclature of the futures contract; he can approach everything in the same fashion for purposes of analyzing the position. He will, of course, have to use proper nomenclature to enter the order, but that comes after the analysis is done.

RATIO SPREADING THE CALLS

Returning to the subject at hand – spreads that capture this particular mispricing phenomenon of futures options – recall that the other strategy that is attractive in such situations is the ratio call spread. It is established with the maximum profit potential being somewhat above the current futures price, since the calls that are being sold are out-of-the-money.

Example: Again using the January soybean options of the previous few examples, suppose that one establishes the following ratio call spread. Using the calls' deltas (see Table 34-2), the following ratio is approximately neutral to begin with:

Buy 2 January bean 600 calls at 11	22 DB
Sell 5 January bean 650 calls at $3\frac{1}{2}$	$17\frac{1}{2}$ CR
Net position:	$4\frac{1}{2}$ Debit

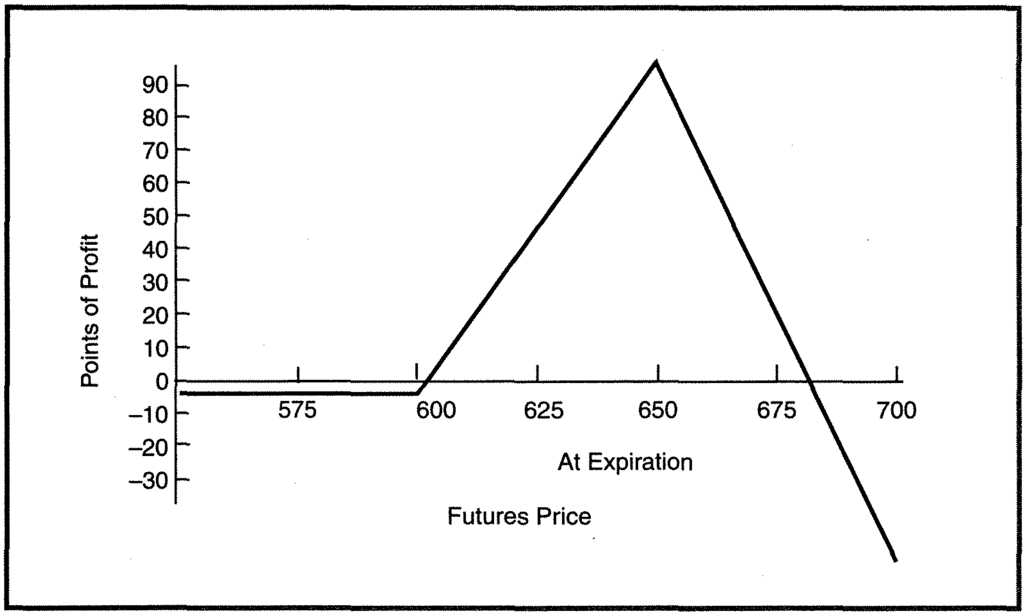
Figure 34-2 shows the profit potential of the ratio call spread. It looks fairly typical for a ratio spread: limited downside exposure, maximum profit potential at the strike of the written calls, and unlimited upside exposure.

Since this spread is established with both options out-of-the-money, one needs some upward movement by January soybean futures in order to be profitable. However, too much movement would not be welcomed (although follow-up strategies could be used to deal with that). Consequently, this is a moderately bullish strategy; one should feel that the underlying futures have a chance to move somewhat higher before expiration.

Again, the analyst should treat this position in terms of points, not dollars or cents of soybean movement, in order to calculate the significant profit and loss points. Refer to Chapter 11 on ratio call spreads for the original explanation of these formulae for ratio call spreads:

$$\text{Maximum downside loss} = \text{Initial debit or credit}$$
$$= -4\frac{1}{2} \text{ (it is a debit)}$$

FIGURE 34-2.
January soybean, ratio spread.



$$\begin{aligned}\text{Points of maximum profit} &= \text{Maximum downside loss} \\ &\quad + \text{Difference in strikes} \\ &\quad \times \text{Number of calls owned} \\ &= -4\tfrac{1}{2} + 50 \times 2 \\ &= 95\tfrac{1}{2}\end{aligned}$$

$$\begin{aligned}\text{Upside break-even price} &= \text{Higher striking price} \\ &\quad + \text{Maximum profit/Net number of naked calls} \\ &= 650 + 95\tfrac{1}{2}/3 \\ &= 681.8\end{aligned}$$

These are the significant points of profitability at expiration. One does not care what the unit of trading is (for example, cents for soybeans) or how many dollars are involved in one unit of trading ($50 for soybeans and soybean options). He can conduct his analysis strictly in terms of points, and he *should* do so.

Before proceeding into the comparisons between the backspread and the ratio spread as they apply to mispriced futures options, it should be pointed out that the serious strategist should analyze how his position will perform over the short term as well as at expiration. These analyses are presented in Chapter 36 on advanced concepts.

WHICH STRATEGY TO USE

The profit potential of the put backspread is obviously far different from that of the call ratio spread. They are similar in that they both offer the strategist the opportunity to benefit from spreading mispriced options. Choosing which one to implement (assuming liquidity in both the puts and calls) may be helped by examining the technical picture (chart) of the futures contract. Recall that futures traders are often more technically oriented than stock traders, so it pays to be aware of basic chart patterns, because others are watching them as well. If enough people see the same thing and act on it, the chart pattern will be correct, if only from a "self-fulfilling prophecy" viewpoint if nothing else.

Consequently, if the futures are locked in a (smooth) downtrend, the put strategy is the strategy of choice because it offers the best downside profit. Conversely, if the futures are in a smooth uptrend, the call strategy is best.

The worst result will be achieved if the strategist has established the call ratio spread, and the futures have an explosive rally. In certain cases, very bullish rumors – weather predictions such as drought or El Niño, foreign labor unrest in the fields or mines, Russian buying of grain – will produce this mispricing phenomenon. The strategist should be leery of using the call ratio spread strategy in such situations, even though the out-of-the-money calls look and are ridiculously expensive. If the rumors prove true, or if there are too many shorts being squeezed, the futures can move too far, too fast and seriously hurt the spreader who has the ratio call spread in place. His margin requirements will escalate quickly as the futures price moves higher. The option premiums will remain high or possibly even expand if the futures rally quickly, thereby overriding the potential benefit of time decay. Moreover, if the fundamentals change immediately – it rains; the strike is settled; no grain credits are offered to the Russians – or rumors prove false, the futures can come crashing back down in a hurry.

Consequently, *if rumors of fundamentals have introduced volatility in the futures market, implement the strategy with the put backspread.* The put backspread is geared to taking advantage of volatility, and this fundamental situation as described is certainly volatile. It may seem that because the market is exploding to the upside, it is a waste of time to establish the put spread. Still, it is the wisest choice in a volatile market, and there is always the chance that an explosive advance can turn into a quick decline, especially when the advance is based on rumors or fundamentals that could change overnight.

There are a few "don'ts" associated with the ratio call spread. Do not be tempted to use the ratio spread strategy in volatile situations such as those just described; it works best in a slowly rising market. Also, do not implement the ratio spread with

ridiculously far out-of-the-money options, as one is wasting his theoretical advantage if the futures do not have a realistic chance to climb to the striking price of the written options. Finally, *do not attempt to use overly large ratios in order to gain the most theoretical advantage.* This is an important concept, and the next example illustrates it well.

Example: Assume the same pricing pattern for January soybean options that has been the basis for this discussion. January beans are trading at 583. The (novice) strategist sees that the slightly in-the-money January 575 call is the cheapest and the deeply out-of-the-money January 675 call is the most expensive. This can be verified from either of two previous tables: the one showing the actual price as compared to the "theoretical" price, or Table 34-2 showing the implied volatilities.

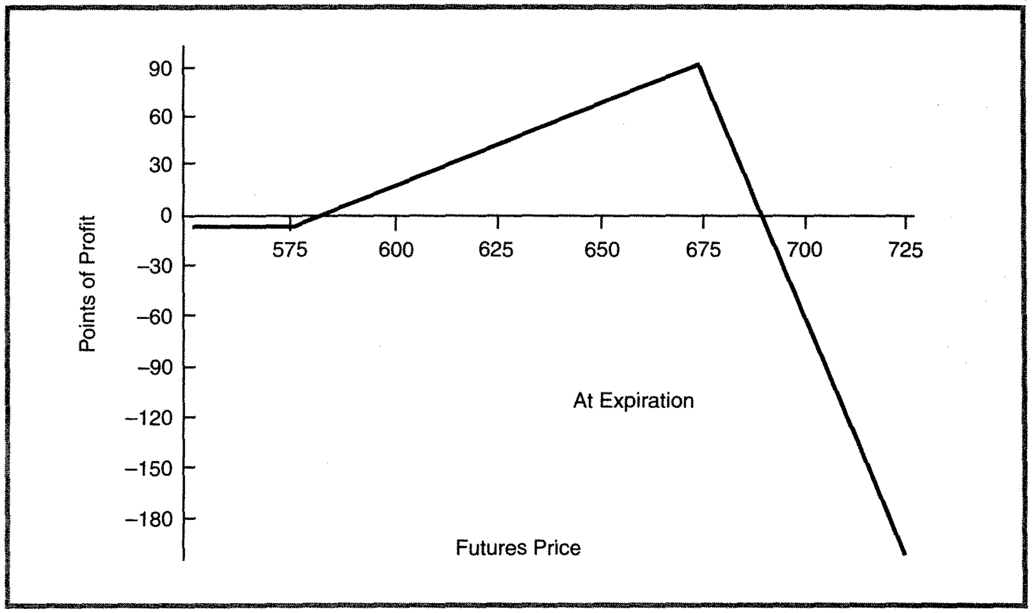
Again, one would use the deltas (see Table 34-2) to create a neutral spread. A neutral ratio of these two would involve selling approximately six calls for each one purchased.

Buy 1 January bean 575 call at $19^1/_2$	$19^1/_2$ DB
Sell 6 January bean 675 calls at $2^1/_4$	$13^1/_2$ CR
Net position:	6 Debit

Figure 34-3 shows the possible detrimental effects of using this large ratio. While one could make 94 points of profit if beans were at 675 at January expiration, he could lose that profit quickly if beans shot on through the upside break-even point, which is only 693.8. The previous formulae can be used to verify these maximum profit and upside break-even point calculations. The upside break-even point is too close to the striking price to allow for reasonable follow-up action. Therefore, this would not be an attractive position from a practical viewpoint, even though at first glance it looks attractive theoretically.

It would seem that neutral spreading could get one into trouble if it "recommends" positions like the 6-to-1 ratio spread. In reality, it is the strategist who is getting into trouble if he doesn't look at the whole picture. The statistics are just an aid – a tool. The strategist must use the tools to his advantage. It should be pointed out as well that there is a tool missing from the toolkit at this point. There are statistics that will clearly show the risk of this type of high-ratio spread. In this case, that tool is the gamma of the option. Chapter 40 covers the use of gamma and other more advanced statistical tools. This same example is expanded in that chapter to include the gamma concept.

FIGURE 34-3.
January soybean, heavily ratioed spread.



FOLLOW-UP ACTION

The same follow-up strategies apply to these futures options as did for stock options. They will not be rehashed in detail here; refer to earlier chapters for broader explanations. This is a summary of the normal follow-up strategies:

Ratio call spread:
- Follow-up action in strategies with naked options, such as this, generally involves taking or limiting losses. A rising market will produce a negative EFP.
- Neutralize a negative EFP by:
  - Buying futures
  - Buying some calls
- Limit upside losses by placing buy stop orders for futures at or near the upside break-even point.

Put backspread:
- Follow-up action in strategies with an excess of long options generally involves taking or protecting profits. A falling market will produce a negative EFP.
- Neutralize a negative EFP by:
  - Buying futures
  - Selling some puts

The reader has seen these follow-up strategies earlier in the book. However, there is one new concept that is important: *The mispricing continues to propagate itself no matter what the price of the underlying futures contract.* The at-the-money options will always be about fairly priced; they will have the average implied volatility.

Example: In the previous examples, January soybeans were trading at 583 and the implied volatility of the options with striking price 575 was 15%, while those with a 600 strike were 17%. One could, therefore, conclude that the at-the-money January soybean options would exhibit an implied volatility of about 16%.

This would still be true if beans were at 525 or 675. The mispricing of the other options would extend out from what is now the at-the-money strike. Table 34-3 shows what one might expect to see if January soybeans rose 75 cents in price, from 583 to 658.

Note that the same mispricing properties exist in both the old and new situations: The puts that are 58 points out-of-the-money have an implied volatility of only 12%, while the calls that are 92 points out-of-the-money have an implied volatility of 23%.

TABLE 34-3.
Propagation of volatility skewing.

Original Situation		New Situation
January beans: 583		January beans: 658
Strike	Implied Volatility	Strike
525	12%	600
550	13%	625
575	15%	650
600	17%	675
625	19%	700
650	21%	725
675	23%	750

This example is not meant to infer that the volatility of an at-the-money soybean futures option will always be 16%. It could be anything, depending on the historical and implied volatility of the futures contract itself. However, the volatility skewing will still persist even if the futures rally or decline.

This fact will affect how these strategies behave as the underlying futures contract moves. It is a benefit to both strategies. First, look at the put backspread when the stock falls to the striking price of the purchased puts.

Example: The put backspread was established under the following conditions:

Strike	Put Price	Theoretical Put Price	Implied Volatility
550	$3^1/_4$	5.4	13%
600	28	27.6	17%

If January soybean futures should fall to 550, one would expect the implied volatility of the January 550 puts that are owned to be about 16% or 17%, since they would be at-the-money at that time. This makes the assumption that the at-the-money puts will have about a 17% implied volatility, which is what they had when the position was established.

Since the strategy involves being long a large quantity of January 550 puts, this increase in implied volatility as the futures drop in price will be of benefit to the spread.

Note that the implied volatility of the January 600 puts would increase as well, which would be a small negative aspect for the spread. However, since there is only one put short and it is quite deeply in the money with the futures at 550, this negative cannot outweigh the positive effect of the expansion of volatility on the long January 550 puts.

In a similar manner, the call spread would benefit. The implied volatility of the written options would actually drop as the futures rallied, since they would be *less* far out-of-the-money than they originally were when the spread was established. While the same can be said of the long options in the spread, the fact that there are extra, naked, options means the spread will benefit overall.

In summary, the futures option strategist should be alert to mispricing situations like those described above. They occur frequently in a few commodities and occasionally in others. The put backspread strategy has limited risk and might therefore be attractive to more individuals; it is best used in downtrending and/or volatile markets. However, if the futures are in a smooth uptrend, not a volatile one, a ratio call spread would be better. In either case, the strategist has established a spread that is statistically attractive because he has sold options that are expensive in relation to the ones that he has bought.

SUMMARY

This chapter presented the basics of futures and futures options trading. The basic differences between futures options and stock or index options were laid out. In a certain sense, a futures option is easier to utilize than is a stock option because the effects of dividends, interest rates, stock splits, and so forth do not apply to futures options. However, the fact that each underlying physical commodity is completely different from most other ones means that the strategist is forced to familiarize himself with a vast array of details involving striking prices, trading units, expiration dates, first notice days, etc.

More details mean there could be more opportunities for mistakes, most of which can be avoided by visualizing and analyzing all positions in terms of points and not in dollars.

Futures options do not create new option strategies. However, they may afford one the opportunity to trade when the futures are locked limit up. Moreover, the volatility skewing that is present in futures options will offer opportunities for put backspreads and call ratio spreads that are not normally present in stock options.

Chapter 35 discusses futures spreads and how one can use futures options with those spreads. Calendar spreads are discussed as well. Calendar spreads with futures options are different from calendar spreads using stock or index options. These are important concepts in the futures markets – distinctly different from an option spread – and are therefore significant for the futures option trader.

CHAPTER 35

Futures Option Strategies for Futures Spreads

A spread with futures is not the same as a spread with options, except that one item is bought while another is simultaneously sold. In this manner, one side of the spread hedges the risk of the other. This chapter describes futures spreading and offers ways to use options as an adjunct to those spreads.

The concept of calendar spreading with futures options is covered in this chapter as well. This is the one strategy that is very different when using futures options, as opposed to using stock or index options.

FUTURES SPREADS

Before getting into option strategies, it is necessary to define futures spreads and to examine some common futures spreading strategies.

FUTURES PRICING DIFFERENTIALS

It has already been shown that, for any particular physical commodity, there are, at any one time, several futures that expire in different months. Oil futures have monthly expirations; sugar futures expire in only five months of any one calendar year. The frequency of expiration months depends on which futures contract one is discussing.

Futures on the same underlying commodity will trade at different prices. The differential is due to several factors, not just time, as is the case with stock options. A major factor is carrying costs – how much one would spend to buy and hold the phys-

ical commodity until futures expiration. However, other factors may enter in as well, including supply and demand considerations. In a normal carrying cost market, futures that expire later in time are more expensive than those that are nearer-term.

Example: Gold is a commodity whose futures exhibit forward or normal carry. Suppose it is March 1st and spot gold is trading at 351. Then, the futures contracts on gold and their respective prices might be as follows:

Expiration Month	Price
April	352.50
June	354.70
August	356.90
December	361.00
June	366.90

Notice that each successive contract is more expensive than the previous one. There is a 2.20 differential between each of the first three expirations, equal to 1.10 per month of additional expiration time. However, the differential is not quite that great for the December, which expires in 9 months, or for the June contract, which expires in 15 months. The reason for this might be that longer-term interest rates are slightly lower than the short-term rates, and so the cost of carry is slightly less.

However, prices in all futures don't line up this nicely. In some cases, different months may actually represent different products, even though both are on the same underlying physical commodity. For example, wheat is not always wheat. There is a summer crop and a winter crop. While the two may be related in general, there could be a substantial difference between the July wheat futures contract and the December contract, for example, that has very little to do with what interest rates are.

Sometimes short-term demand can dominate the interest rate effect, and a series of futures contracts can be aligned such that the short-term futures are more expensive. This is known as a reverse carrying charge market, or contango.

INTRAMARKET FUTURES SPREADS

Some futures traders attempt to predict the relationships between various expiration months on the same underlying physical commodity. That is, one might buy July soybean futures and sell September soybean futures. *When one both buys and sells differing futures contracts, he has a spread. When both contracts are on the same underlying physical commodity, he has an intramarket spread.*

The spreader is not attempting to predict the overall direction of prices. Rather, he is trying to predict the *differential* in prices between the July and September contracts. He doesn't care if beans go up or down, as long as the spread between July and September goes his way.

Example: A spread trader notices that historic price charts show that if September soybeans get too expensive with respect to July soybeans, the differential usually disappears in a month or two. The opportunity for establishing this trade usually occurs early in the year – February or March.

Assume it is February 1st, and the following prices exist:

July soybean futures: 600 ($6.00/bushel)

September soybean futures: 606

The price differential is 6 cents. It rarely gets worse than 12 cents, and often reverses to the point that July futures are more expensive than soybean futures – some years as much as 100 cents more expensive.

If one were to trade this spread from a historical perspective, he would thus be risking approximately 6 cents, with possibilities of making over 100 cents. That is certainly a good risk/reward ratio, if historic price patterns hold up in the current environment.

Suppose that one establishes the spread:

Buy one July future @ 600

Sell one September future @ 606

At some later date, the following prices and, hence, profits and losses, exist.

Futures Price	Profit/Loss
July: 650	+50 cents
September: 630	–24 cents
Total Profit:	26 cents ($1,300)

The spread has inverted, going from an initial state in which September was 6 cents more expensive than July, to a situation in which July is 20 cents more expensive. The spreader would thus make 26 cents, or $1,300, since 1 cent in beans is worth $50.

Notice that the same profit would have been made at any of the following pairs of prices, because the price differential between July and September is 20 cents in all cases (with July being the more expensive of the two).

July Futures	September Futures	July Profit	September Profit
420	400	−180	+206
470	450	−130	+156
550	530	−50	+76
600	580	0	+26
650	630	+50	−24
700	680	+100	−74
800	780	+200	−174

Therefore, the same 26-cent profit can be made whether soybeans are in a severe bear market, in a rousing bull market, or even somewhat unchanged. The spreader is only concerned with whether the spread widens from a 6-cent differential or not.

Charts, some going back years, are kept of the various relationships between one expiration month and another. Spread traders often use these historical charts to determine when to enter and exit intramarket spreads. These charts display the seasonal tendencies that make the relationships between various contracts widen or shrink. Analysis of the fundamentals that cause the seasonal tendencies could also be motivation for establishing intramarket spreads.

The margin required for intramarket spread trading (and some other types of futures spreads) is smaller than that required for speculative trading in the futures themselves. The reason for this is that spreads are considered less risky than outright positions in the futures. However, one can still make or lose a good deal of money in a spread – percentage-wise as well as in dollars – so it cannot be considered conservative; it's just less risky than outright futures speculation.

Example: Using the soybean spread from the example above, assume the speculative initial margin requirement is $1,700. Then, the spread margin requirement might be $500. That is considerably less than one would have to put up as initial margin if each side of the spread had to be margined separately, a situation that would require $3,400.

In the previous example, it was shown that the soybean spread had the potential to widen as much as 100 points ($1.00), a move that would be worth $5,000 if it

occurred. While it is unlikely that the spread would actually widen to historic highs, it is certainly possible that it could widen 25 or 30 cents, a profit of $1,250 to $1,500.

That is certainly high leverage on a $500 investment over a short time period, so one must classify spreading as a risk strategy.

INTERMARKET FUTURES SPREADS

Another type of futures spread is one in which one buys futures contracts in one market and sells futures contracts in another, probably related, market. *When the futures spread is transacted in two different markets, it is known as an intermarket spread.* Intermarket spreads are just as popular as intramarket spreads.

One type of intermarket spread involves directly related markets. Examples include spreads between currency futures on two different international currencies; between financial futures on two different bond, note, or bill contracts; or between a commodity and its products – oil, unleaded gasoline, and heating oil, for example.

Example: Interest rates have been low in both the United States and Japan. As a result, both currencies are depressed with respect to the European currencies, where interest rates remain high. A trader believes that interest rates will become more uniform worldwide, causing the Japanese yen to appreciate with respect to the German mark.

However, since he is not sure whether Japanese rates will move up or German rates will move down, he is reluctant to take an outright position in either currency. Rather, he decides to utilize an intermarket spread to implement his trading idea.

Assume he establishes the spread at the following prices:

Buy 1 June yen future: 77.00

Sell 1 June mark future: 60.00

This is an initial differential of 17.00 between the two currency futures. He is hoping for the differential to get larger. The dollar trading terms are the same for both futures: One point of movement (from 60.00 to 61.00, for example) is worth $1,250. His profit and loss potential would therefore be:

Spread Differential at a Later Date	Profit/Loss
14.00	– $3,750
16.00	– $1,250
18.00	+ 1,250
20.00	+ 3,750

In some cases, the exchanges recognize frequently traded intermarket spreads as being eligible for reduced margin requirements. That is, the exchange recognizes that the two futures are hedges against one another if one is sold and the other is bought.

These spreads between currencies, called cross-currency spreads, are so heavily traded that there are other specific vehicles – both futures and warrants – that allow the speculator to trade them as a single entity. Regardless, they serve as a prime example of an intermarket spread when the two futures are used.

In the example above, assume the outright speculative margin for a position in either currency future is \$1,700 per contract. Then, the margin for this spread would probably be nearly \$1,700 as well, equal to the speculative margin for one side of the spread. This position is thus recognized as a spread position for margin purposes. The margin treatment isn't as favorable as for the intramarket spread (see the earlier soybean example), but the spread margin is still only one-half of what one would have to advance as initial margin if both sides of the spread had to be margined separately.

Other intermarket spreads are also eligible for reduced margin requirements, although at first glance they might not seem to be as direct a hedge as the two currencies above were.

Example: A common intermarket spread is the TED spread, which consists of Treasury bill futures on one side and Eurodollar futures on the other. Treasury bills represent the safest investment there is; they are guaranteed. Eurodollars, however, are not insured, and therefore represent a less safe investment. Consequently, Eurodollars yield more than Treasury bills. How much more is the key, because as the yield differential expands or shrinks, the spread between the prices of T-bill futures and Eurodollar futures expands or shrinks as well. In essence, the yield differential is small when there is stability and confidence in the financial markets, because uninsured deposits and insured deposits are not that much different in times of financial certainty. However, in times of financial uncertainty and instability, the spread widens because the uninsured depositors require a comparatively higher yield for the higher risk they are taking.

Assume the outright initial margin for either the T-bill future or the Eurodollar future is \$800 per contract. The margin for the TED spread, however, is only \$400. Thus, one is able to trade this spread for only one-fourth of the amount of margin that would be required to margin both sides separately.

The reason that the margin is more favorable is that there is not a lot of volatility in this spread. Historically, it has ranged between about 0.30 and 1.70. In both futures contracts, one cent (0.01) of movement is worth \$25. Thus, the entire 140-cent historic range of the spread only represents \$3,500 (140 × \$25).

More will be said later about the TED spread when the application of futures options to intermarket spreads is discussed. Since there is a liquid option market on both futures, it is sometimes more logical to establish the spread using options instead of futures.

One other comment should be made regarding the TED spread: It has carrying cost. That is, if one buys the spread and holds it, the spread will shrink as time passes, causing a small loss to the holder. When interest rates are low, the carrying cost is small (about 0.05 for 3 months). It would be larger if short-term rates rose. The prices in Table 35-1 show that the spread is more costly for longer-term contracts.

TABLE 35-1.
Carrying costs of the TED spread.

Month	T-Bill Future	Eurodollar Future	TED Spread
March	96.27	95.86	0.41
June	96.15	95.69	0.46
September	95.90	95.39	0.51

Many intermarket spreads have some sort of carrying cost built into them; the spreader should be aware of that fact, for it may figure into his profitability.

One final, and more complex, example of an intermarket spread is the crack spread. There are two major areas in which a basic commodity is traded, as well as two of its products: crude oil, unleaded gasoline, and heating oil; or soybeans, soybean oil, and soybean meal. A crack spread involves trading all three – the base commodity and both byproducts.

Example: The crack spread in oil consists of buying two futures contracts for crude oil and selling one contract each for heating oil and unleaded gasoline.

The units of trading are not the same for all three. The crude oil future is a contract for 1,000 barrels of oil; it is traded in units of dollars per barrel, so a $1 increase in oil prices – from $18.00 to $19.00, say – is worth $1,000 to the futures contract. Heating oil and unleaded gasoline futures contracts have similar terms, but they are different from crude oil. Each of these futures is for 42,000 gallons of the product, and they are traded in cents. So, a one-cent move – gasoline going from 60 cents a gallon to 61 cents a gallon – is worth $420. This information is summarized in Table 35-2 by showing how much a unit change in price is worth.

TABLE 35-2.
Terms of oil production contract.

Contract	Initial Price	Subsequent Price	Gain in Dollars
Crude Oil	18.00	19.00	$1,000
Unleaded Gasoline	.6000	.6100	$ 420
Heating Oil	.5500	.5600	$ 420

The following formula is generally used for the oil crack spread:

$$\text{Crack} = \frac{(\text{Unleaded gasoline} + \text{Heating oil}) \times 42 - 2 \times \text{Crude}}{2}$$

$$= \frac{(.6000 + .5500) \times 42 - 2 \times 18.00}{2}$$

$$= (48.3 - 36)/2$$

$$= 6.15$$

Some traders don't use the divisor of 2 and, therefore, would arrive at a value of 12.30 with the above data.

In either case, the spreader can track the history of this spread and will attempt to buy oil and sell the other two, or vice versa, in order to attempt to make an overall profit as the three products move. Suppose a spreader felt that the products were too expensive with respect to crude oil prices. He would then implement the spread in the following manner:

Buy 2 March crude oil futures @ 18.00
Sell 1 March heating oil future @ 0.5500
Sell 1 March unleaded gasoline future @ 0.6000

Thus, the crack spread was at 6.15 when he entered the position. Suppose that he was right, and the futures prices subsequently changed to the following:

March crude oil futures:	18.50
March unleaded gas futures:	.6075
March heating oil futures:	.5575

The profit is shown in Table 35-3.

TABLE 35-3.
Profit and loss of crack spread.

Contract	Initial Price	Subsequent Price	Gain in Dollars
2 March Crude	18.00	18.50	+ $1,000
1 March Unleaded	.6000	.6075	– $ 315
1 March Heating Oil	.5500	.5575	– $ 315
Net Profit (before commissions)			+ $ 370

One can calculate that the crack spread at the new prices has shrunk to 5.965. Thus, the spreader was correct in predicting that the spread would narrow, and he profited.

Margin requirements are also favorable for this type of spread, generally being slightly less than the speculative requirement for two contracts of crude oil.

The above examples demonstrate some of the various intermarket spreads that are heavily watched and traded by futures spreaders. They often provide some of the most reliable profit situations without requiring one to predict the actual direction of the market itself. Only the differential of the spread is important.

One should not assume that all intermarket spreads receive favorable margin treatment. Only those that have traditional relationships do.

USING FUTURES OPTIONS IN FUTURES SPREADS

After viewing the above examples, one can see that futures spreads are not the same as what we typically know as option spreads. However, option contracts may be useful in futures spreading strategies. They can often provide an additional measure of profit potential for very little additional risk. This is true for both intramarket and intermarket spreads.

The futures option calendar spread is discussed first. The calendar spread with futures options is not the same as the calendar spread with stock or index options. In fact, it may best be viewed as an alternative to the intramarket futures spread rather than as an option spread strategy.

CALENDAR SPREADS

A calendar spread with futures options would still be constructed in the familiar manner – buy the May call, sell the March call with the same striking price. However,

there is a major difference between the futures option calendar spread and the stock option calendar spread. That difference is that *a calendar spread using futures options involves two separate underlying instruments, while a calendar spread using stock options does not.* When one buys the May soybean 600 call and sells the March soybean 600 call, he is buying a call on the May soybean futures contract and selling a call on the March soybean futures contract. Thus, the futures option calendar spread involves two separate, but related, underlying futures contracts. However, if one buys the IBM May 100 call and sells the IBM March 100 call, both calls are on the same underlying instrument, IBM. This is a major difference between the two strategies, although both are called "calendar spreads."

To the stock option trader who is used to visualizing calendar spreads, the futures option variety may confound him at first. For example, a stock option trader may conclude that if he can buy a four-month call for 5 points and sell a two-month call for 2 points, he has a good calendar spread possibility. Such an analysis is meaningless with futures options. If one can buy the May soybean 600 call for 5 and sell the March soybean 600 call for 3, is that a good spread or not? It's impossible to tell, unless you know the relationship between May and March soybean futures contracts. Thus, in order to analyze the futures option calendar spread, one must not only analyze the options' relationship, but the two futures contracts' relationship as well. Simply stated, when one establishes a futures option calendar spread, he is not only spreading time, as he does with stock options, he is also spreading the relationship between the underlying futures.

Example: A trader notices that near-term options in soybeans are relatively more expensive than longer-term options. He thinks a calendar spread might make sense, as he can sell the overpriced near-term calls and buy the relatively cheaper longer-term calls. This is a good situation, considering the theoretical value of the options involved. He establishes the spread at the following prices:

Soybean Contract	Initial Price	Trading Position
March 600 call	14	Sell 1
May 600 call	21	Buy 1
March future	594	none
May future	598	none

The May/March 600 call calendar spread is established for 7 points debit. March expiration is two months away. At the current time, the May futures are trading at a 4-point premium to March futures. The spreader figures that if March

futures are approximately unchanged at expiration of the March options, he should profit handsomely, because the March calls are slightly overpriced at the current time, plus they will decay at a faster rate than the May calls over the next two months.

Suppose that he is correct and March futures are unchanged at expiration of the March options. This is still no guarantee of profit, because one must also determine where May futures are trading. If the spread between May and March futures behaves poorly (May declines with respect to March), then he might still lose money. Look at the following table to see how the futures spread between March and May futures affects the profitability of the calendar spread. The calendar spread cost 7 debit when the futures spread was +4 initially.

Futures Prices March/May	Futures Spread Price	May 600 Call Price	Calendar Spread Profit/Loss
594/570	−24	4	−3 cents
594/580	−14	6½	−½
594/590	−4	10	+3
594/600	+6	14½	+7½

Thus, the calendar spread could lose money even with March futures unchanged, as in the top two lines of the table. It also could do better than expected if the futures spread widens, as in the bottom line of the table.

The profitability of the calendar spread is heavily linked to the futures spread price. In the above example, it was possible to lose money even though the March futures contract was unchanged in price from the time the calendar spread was initially established. This would never happen with stock options. If one placed a calendar spread on IBM and the stock were unchanged at the expiration of the near-term option, the spread would make money virtually all of the time (unless implied volatility had shrunk dramatically).

The futures option calendar spreader is therefore trading two spreads at once. The first one has to do with the relative pricing differentials (implied volatilities, for example) of the two options in question, as well as the passage of time. The second one is the relationship between the two underlying futures contracts. As a result, it is difficult to draw the ordinary profit picture. Rather, one must approach the problem in this manner:

1. Use the horizontal axis to represent the futures spread price at the expiration of the near-term option.

2. Draw several profit curves, one for each price of the near-term future at near-term expiration.

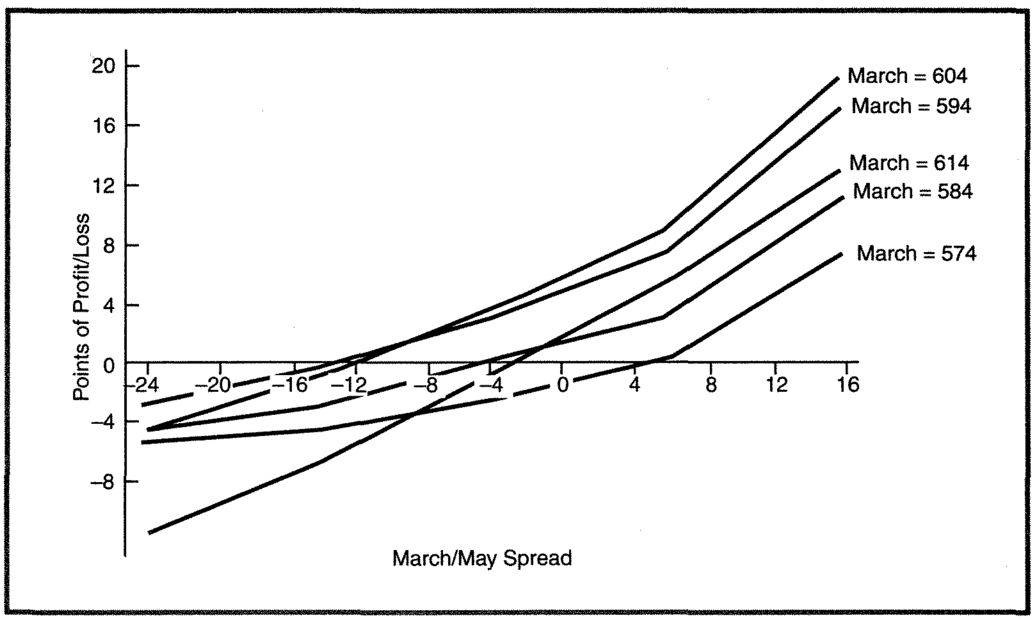
Example: Expanding on the above example, this method is demonstrated here.

Figure 35-1 shows how to approach the problem. The horizontal axis depicts the spread between March and May soybean futures at the expiration of the March futures options. The vertical axis represents the profit and loss to be expected from the calendar spread, as it always does.

The major difference between this profit graph and standard ones is that there are now several sets of profit curves. A separate one is drawn for each price of the *March futures* that one wants to consider in his analysis. The previous example showed the profitability for only one price of the March futures – unchanged at 594. However, one cannot rely on the March futures to remain unchanged, so he must view the profitability of the calendar spread at various March futures prices.

The data that is plotted in the figure is summarized in Table 35-4. Several things are readily apparent. First, if the futures spread improves in price, the calendar spread will generally make money. These are the points on the far right of the figure and on the bottom line of Table 35-4. Second, if the futures spread behaves miser-

FIGURE 35-1.
Soybean futures calendar spreads, at March expiration.



ably, the calendar spread will almost certainly lose money (points on the left-hand side of the figure, or top line of the table).

Third, if March futures rise in price too far, the calendar spread could do poorly. In fact, if March futures rally *and* the futures spread worsens, *one could lose more than his initial debit* (bottom left-hand point on figure). This is partly due to the fact that one is buying the March options back at a loss if March futures rally, and may also be forced to sell his May options out at a loss if May futures have fallen at the same time.

Fourth, as might be expected, the best results are obtained if March futures rally slightly or remain unchanged and the futures spread also remains relatively unchanged (points in the upper right-hand quadrant of the figure).

In Table 35-4, the far right-hand column shows how a futures spreader would have fared if he had bought May and sold March at 4 points May over March, not using any options at all.

TABLE 35-4.
Profit and loss from soybean call calendar.

All Prices at March Option Expiration							
Futures Spread		Calendar Spread Profit					Future Spread
(May-March)	March Future Price:	574	584	594	604	614	Profit
−24		−5.5	− 4.5	−3	−4.5	−11.5	−28
−14		−4.5	− 3	−0.5	−1	−7	−18
−4		−2.5	0	+3	+3.5	−1	− 8
6		0	+ 3	+7.5	+9	+5.5	+ 2
16		+7	+11	+17	+19	+13	+12

This example demonstrates just how powerful the influence of the *futures* spread is. The calendar spread profit is predominantly a function of the futures spread price. Thus, even though the calendar spread was attractive from the theoretical viewpoint of the option's prices, its result does not seem to reflect that theoretical advantage, due to the influence of the futures spread. Another important point for the calendar spreader used to dealing with stock options to remember is that *one can lose more than his initial debit in a futures calendar spread* if the spread between the underlying futures inverts.

There is another way to view a calendar spread in futures options, however, and that is as a substitute or alternative to an intramarket spread in the futures contracts themselves. Look at Table 35-4 again and notice the far right-hand column. This is

the profit or loss that would be made by an intramarket soybean spreader who bought May and sold March at the initial prices of 598 and 594, respectively. The calendar spread generally outperforms the intramarket spread for the prices shown in this example. This is where the true theoretical advantage of the calendar spread comes in. So, *if one is thinking of establishing an intramarket spread, he should check out the calendar spread in the futures options first.* If the options have a theoretical pricing advantage, the calendar spread may clearly outperform the standard intramarket spread.

Study Table 35-4 for a moment. Note that the intramarket spread is only better when prices drop but the spread widens (lower left corner of table). In all other cases, the calendar spread strategy is better. One could not always expect this to be true, of course; the results in the example are partly due to the fact that the March options that were sold were relatively expensive when compared with the May options that were bought.

In summary, the futures option calendar spread is more complicated when compared to the simpler stock or index option calendar spread. As a result, calendar spreading with futures options is a less popular strategy than its stock option counterpart. However, this does not mean that the strategist should overlook this strategy. As the strategist knows, he can often find the best opportunities in seemingly complex situations, because there may be pricing inefficiencies present. This strategy's main application may be for the intramarket spreader who also understands the usage of options.

LONG COMBINATIONS

Another attractive use of options is as a substitute for two instruments that are being traded one against the other. Since intermarket and intramarket futures spreads involve two instruments being traded against each other, futures options may be able to work well in these types of spreads. You may recall that a similar idea was presented with respect to pairs trading, as well as certain risk arbitrage strategies and index futures spreading.

In any type of futures spread, one might be able to substitute options for the actual futures. He might buy calls for the long side of the spread instead of actually buying futures. Likewise, he could sell calls or buy puts instead of selling futures for the other side of the spread. In using options, however, he wants to avoid two problems. First, he does not want to increase his risk. Second, he does not want to pay a lot of time value premium that could waste away, costing him the profits from his spread.

Let's spend a short time discussing these two points. First, he does not want to increase his risk. In general, selling options instead of utilizing futures increases one's risk. If he sells calls instead of selling futures, and sells puts instead of buying futures, he could be increasing his risk tremendously if the futures prices moved a lot. If the futures rose tremendously, the short calls would lose money, but the short puts would cease to make money once the futures rose through the striking price of the puts. *Therefore, it is* not *a recommended strategy to sell options in place of the futures in an intramarket or intermarket spread.* The next example will show why not.

Example: A spreader wants to trade an intramarket spread in live cattle. The contract is for 40,000 pounds, so a one-cent move is worth $400. He is going to sell April and buy June futures, hoping for the spread to narrow between the two contracts.

The following prices exist for live cattle futures and options:

April future: 78.00

June future: 74.00

April 78 call: 1.25

June 74 put: 2.00

He decides to use the options instead of futures to implement this spread. He sells the April 78 call as an alternative to selling the April future; he also sells the June 74 put as an alternative to buying the June future.

Sometime later, the following prices exist:

April future: 68.00

June future: 66.00

April 78 call: 0.00

June 74 put: 8.05

The futures spread has indeed narrowed as expected – from 4.00 points to 2.00. However, this spreader has no profit to show for it; in fact he has a loss. The call that he sold is now virtually worthless and has therefore earned a profit of 1.25 points; however, the put that was sold for 2.00 is now worth 8.05 – a loss of 6.05 points. Overall, the spreader has a net loss of 4.80 points since he used short options, instead of the 2.00-point gain he could have had if he had used futures instead.

The second thing that the futures spreader wants to ensure is that he does not pay for a lot of time value premium that is wasted, costing him his potential profits. If he buys at- or out-of-the-money calls instead of buying futures, and if he buys at-

or out-of-the-money puts instead of selling futures, he could be exposing his spread profits to the ravages of time decay. *Do not substitute at- or out-of-the-money options for the futures in intramarket or intermarket spreads.* The next example will show why not.

Example: A futures spreader notices that a favorable situation exists in wheat. He wants to buy July and sell May. The following prices exist for the futures and options:

May futures: 410

July futures: 390

May 410 put: 20

July 390 call: 25

This trader decides to buy the May 410 put instead of selling May futures; he also buys the July 390 call instead of buying July futures.

Later, the following prices exist:

May futures: 400

July futures: 400

May 410 put: 25

July 390 call: 30

The futures spread would have made 20 points, since they are now the same price. At least this time, he has made money in the option spread. He has made 5 points on each option for a total of 10 points overall – only half the money that could have been made with the futures themselves. Note that these sample option prices still show a good deal of time value premium remaining. If more time had passed and these options were trading closer to parity, the result of the option spread would be worse.

It might be pointed out that the option strategy in the above example would work better if futures prices were volatile and rallied or declined substantially. This is true to a certain extent. If the market had moved a lot, one option would be very deeply in-the-money and the other deeply out-of-the-money. Neither one would have much time value premium, and the trader would therefore have wasted all the money spent for the initial time premium. So, unless the futures moved so far as to outdistance that loss of time value premium, the futures strategy would still outrank the option strategy.

However, this last point of volatile futures movement helping an option position is a valid one. It leads to the reason for the only favorable option strategy that is a sub-

stitute for futures spreads – that is, using in-the-money options. *If one buys in-the-money calls instead of buying futures, and buys in-the-money puts instead of selling futures, he can often create a position that has an advantage over the intramarket or intermarket futures spread.* In-the-money options avoid most of the problems described in the two previous examples. There is no increase of risk, since the options are being bought, not sold. In addition, the amount of money spent on time value premium is small, since both options are in-the-money. In fact, one could buy them so far in the money as to virtually eliminate any expense for time value premium. However, that is not recommended, for it would negate the possible advantage of using moderately in-the-money options: *If the underlying futures behave in a volatile manner, it might be possible for the option spread to make money, even if the futures spread does not behave as expected.*

In order to illustrate these points, the TED spread, an intermarket spread, will be used. Recall that in order to buy the TED spread, one would buy T-bill futures and sell an equal quantity of Eurodollar futures.

Options exist on both T-bill futures and Eurodollar futures. If T-bill calls were bought instead of T-bill futures, and if Eurodollar puts were bought instead of selling Eurodollar futures, a similar position could be created that might have some advantages over buying the TED spread using futures. The advantage is that if T-bills and/or Eurodollars change in price by a large enough amount, the option strategist can make money, even if the TED spread itself does not cooperate.

One might not think that short-term rates could be volatile enough to make this a worthwhile strategy. However, they can move substantially in a short period of time, especially if the Federal Reserve is active in lowering or raising rates. For example, suppose the Fed continues to lower rates and both T-bills and Eurodollars substantially rise in price. Eventually, the puts that were purchased on the Eurodollars will become worthless, but the T-bill calls that are owned will continue to grow in value. Thus, one could make money, even if the TED spread was unchanged or shrunk, as long as short-term rates dropped far enough.

Similarly, if rates were to rise instead, the option spread could make money as the puts gained in value (rising rates mean T-bills and Eurodollars will fall in price) and the calls eventually became worthless.

Example: The following prices for June T-bill and Eurodollar futures and options exist in January. All of these products trade in units of 0.01, which is worth $25. So a whole point is worth $2,500.

June T-bill futures: 94.75

June Euro$ futures: 94.15

June T-bill 9450 calls: 0.32

June Euro$ 9450 puts: 0.40

The TED spread, basis June, is currently at 0.60 (the difference in price of the two futures). Both futures have in-the-money options with only a small amount of time value premium in them.

The June T-bill calls with a striking price of 94.50 are 0.25 in the money and are selling for 0.32. Their time value premium is only 0.07 points. Similarly, the June Eurodollar puts with a striking price of 94.50 are 0.35 in the money and are selling for 0.40. Hence, their time value premium is 0.05.

Since the total time value premium – 0.12 ($300) – is small, the strategist decides that the option spread may have an advantage over the futures intermarket spread, so he establishes the following position:

	Cost
Buy one June T-bill call @ 0.40	$1,000
Buy one June Euro$ put @ 0.32	$ 800
Total cost:	$1,800

Later, financial conditions in the world are very stable and the TED spread begins to shrink. However, at the same time, rates are being lowered in the United States, and T-bill and Eurodollar prices begin to rally substantially. In May, when the June T-bill options expire, the following prices exist:

June T-bill futures: 95.50

June Euro$ futures: 95.10

June T-bill 9450 calls: 1.00

June Euro$ 9450 puts: 0.01

The TED spread has shrunk from 0.60 to only 0.40. Thus, any trader attempting to buy the TED spread using only futures would have lost $500 as the spread moved against him by 0.20.

However, look at the option position. The options are now worth a combined value of 1.01 points ($2,525), and they were bought for 0.72 points ($1,800). Thus, the option strategy has turned a profit of $725, while the futures strategy would have lost money.

Any traders who used this option strategy instead of using futures would have enjoyed profits, because as the Federal Reserve lowered rates time after time, the prices of both T-bills and Eurodollars rose far enough to make the option strategist's

calls more profitable than the loss in his puts. This is the advantage of using in-the-money options instead of futures in futures spreading strategies.

In fairness, it should be pointed out that if the futures prices had remained relatively unchanged, the 0.12 points of time value premium ($300) could have been lost, while the futures spread may have been relatively unchanged. However, this does not alter the reasoning behind wanting to use this option strategy.

Another consideration that might come into play is the margin required. Recall that the initial margin for implementing the TED spread was $400. However, if one uses the option strategy, he must pay for the options in full – $1,800 in the above example. This could conceivably be a deterrent to using the option strategy. Of course, if by investing $1,800, one can make money instead of losing money with the smaller investment, then the initial margin requirement is irrelevant. Therefore, the profit potential must be considered the more important factor.

FOLLOW-UP CONSIDERATIONS

When one uses long option combinations to implement a futures spread strategy, he may find that his position changes from a spread to more of an outright position. This would occur if the markets were volatile and one option became deeply in-the-money, while the other one was nearly worthless. The TED spread example above showed how this could occur as the call wound up being worth 1.00, while the put was virtually worthless.

As one side of the option spread goes out-of-the-money, the spread nature begins to disappear and a more outright position takes its place. One can use the deltas of the options in order to calculate just how much exposure he has at any one time. The following examples go through a series of analyses and trades that a strategist might have to face. The first example concerns establishing an intermarket spread in oil products.

Example: In late summer, a spreader decides to implement an intermarket spread. He projects that the coming winter may be severely cold; furthermore, he believes that gasoline prices are too high, being artificially buoyed by the summer tourist season, and the high prices are being carried into the future months by inefficient market pricing.

Therefore, he wants to buy heating oil futures or options and sell unleaded gasoline futures or options. He plans to be out of the trade, if possible, by early December, when the market should have discounted the facts about the winter. Therefore, he decides to look at January futures and options. The following prices exist:

Future or Option	Price	Time Value Premium
January heating oil futures:	.6550	
January unleaded gasoline futures:	.5850	
January heating oil 60 call:	6.40	0.90
January unleaded gas 62 put:	4.25	0.75

The differential in futures prices is .07, or 7 cents per gallon. He thinks it could grow to 12 cents or so by early winter. However, he also thinks that oil and oil products have the potential to be very volatile, so he considers using the options. One cent is worth $420 for each of these items.

The time value premium of the options is 1.65 for the put and call combined. If he pays this amount ($693) per combination, he can still make money if the futures widen by 5.00 points, as he expects. Moreover, the option spread gives him the potential for profits if oil products are volatile, even if he is wrong about the futures relationship.

Therefore, he decides to buy five combinations:

Position	Cost
Buy 5 January heating oil 60 calls @ 6.40	$13,440
Buy 5 January unleaded 62 puts @ 4.25	8,925
Total cost:	$22,365

This initial cost is substantially larger than the initial margin requirement for five futures spreads, which would be about $7,000. Moreover, the option cost must be paid for in cash, while the futures requirement could be taken care of with Treasury bills, which continue to earn money for the spreader. Still, the strategist believes that the option position has more potential, so he establishes it.

Notice that in this analysis, *the strategist compared his time value premium cost to the profit potential he expected from the futures spread itself.* This is often a good way to evaluate whether or not to use options or futures. In this example, he thought that, even if futures prices remained relatively unchanged, thereby wasting away his time premium, he could still make money – as long as he was correct about heating oil outperforming unleaded gasoline.

Some follow-up actions will now be examined. If the futures rally, the position becomes long. Some profit might have accrued, but the whole position is subject to losses if the futures fall in price. The strategist can calculate the extent to which his

position has become long by using the delta of the options in the strategy. He can then use futures or other options in order to make the position more neutral, if he wants to.

Example: Suppose that both unleaded gasoline and heating oil have rallied some and that the futures spread has widened slightly. The following information is known:

Future or Option	Price	Net Change	Profit/Loss
January heating oil futures:	.7100	+ .055	
January unleaded gasoline futures:	.6300	+ .045	
January heating oil 60 call:	11.05	+ 4.65	+$9,765
January unleaded gas 62 put:	1.50	− 2.75	− 5,775
Total profit:			+$3,990

The futures spread has widened to 8 cents. If the strategist had established the spread with futures, he would now have a one-cent ($420) profit on five contracts, or a $2,100 profit. The profit is larger in the option strategy.

The futures have rallied as well. Heating oil is up 5½ cents from its initial price, while unleaded is up 4½ cents. This rally has been large enough to drive the puts out-of-the-money. When one has established the intermarket spread with options, and the futures rally this much, the profit is usually greater from the option spread. Such is the case in this example, as the option spread is ahead by almost $4,000.

This example shows the most desirable situation for the strategist who has implemented the option spread. The futures rally enough to force the puts out-of-the-money, or alternatively fall far enough to force the calls to be out-of-the-money. If this happens in advance of option expiration, one option will generally have almost all of its time value premium disappear (the calls in the above example). The other option, however, will still have some time value (the puts in the example).

This represents an attractive situation. However, there is a potential negative, and that is that the position is too long now. It is not really a spread anymore. If futures should drop in price, the calls will lose value quickly. The puts will not gain much, though, because they are out-of-the-money and will not adequately protect the calls. At this juncture, the strategist has the choice of taking his profit – closing the position – or making an adjustment to make the spread more neutral once again. He could also do nothing, of course, but a strategist would normally want to protect a profit to some extent.

Example: The strategist decides that, since his goal was for the futures spread to widen to 12 cents, he will not remove the position when the spread is only 8 cents, as it is now. However, he wants to take some action to protect his current profit, while still retaining the possibility to have the profit expand.

As a first step, the equivalent futures position (EFP) is calculated. The pertinent data is shown in Table 35-5.

TABLE 35-5.
EFP of long combination.

Future or Option	Price	Delta	EFP
January heating oil futures:	.7100		
January unleaded gasoline futures:	.6300		
January heating oil 60 call: Long 5	11.05	0.99	+4.95
January unleaded gas 62 put: Long 5	1.50	−0.40	−2.00
		Total EFP:	+2.95

Overall, the position is long the equivalent of about three futures contracts. The position's profitability is mostly related to whether the futures rise or fall in price, not to how the spread between heating oil futures and unleaded gas futures behaves.

The strategist could easily neutralize the long delta by selling three contracts. This would leave room for more profits if prices continue to rise (there are still two extra long calls). It would also provide downside protection if prices suddenly drop, since the 5 long puts plus the 3 short futures would offset any loss in the 5 in-the-money calls.

Which futures should the strategist short? That depends on how confident he is in his original analysis of the intermarket spread widening. If he still thinks it will widen further, then he should sell unleaded gasoline futures against the deeply in-the-money heating oil calls. This would give him an additional profit or loss opportunity based on the relationship of the two oil products. However, if he decides that the intermarket spread should have widened more than this by now, perhaps he will just sell 3 heating oil futures as a direct hedge against the heating oil calls.

Once one finds himself in a profitable situation, as in the above example, *the most conservative course is to hedge the in-the-money option with its own underlying future.* This action lessens the further dependency of the profits on the intermarket spread. There is still profit potential remaining from futures price action. Furthermore, if the futures should fall so far that both options return to in-the-money status, then the intermarket spread comes back into play. Thus, in the above

example, the conservative action would be to sell three heating oil futures against the heating oil calls.

The more aggressive course is to hedge the in-the-money option with the future underlying the other side of the intermarket spread. In the above example, that would entail selling the unleaded gasoline futures against the heating oil calls.

Suppose that the strategist in the previous example decides to take the conservative action, and he therefore shorts three heating oil futures at .7100, the current price. This action preserves large profit potential in either direction. It is better than selling out-of-the-money options against his current position.

He would consider removing the hedge if futures prices dropped, perhaps when the puts returned to an in-the-money status with a put delta of at least –0.75 or so. At that point, the position would be at its original status, more or less, except for the fact that he would have taken a nice profit in the three futures that were sold and covered.

Epilogue. The above examples are taken from actual price movements. In reality, the futures fell back, not only to their original price, but far below it. The fundamental reason for this reversal was that the weather was warm, hurting demand for heating oil, and gasoline supplies were low. By the option expiration in December, the following prices existed:

January heating oil futures: .5200

January unleaded gas futures: .5200

Not only had the futures prices virtually crashed, but the intermarket spread had been decimated as well. The spread had fallen to zero! It had never reached anything near the 12-cent potential that was envisioned. Any spreader who had established this spread with futures would almost certainly have lost money; he probably would not have held it until it reached this lowly level, but there was never much opportunity to get out at a profit.

The strategist who established the spread with options, however, most certainly would have made money. One could safely assume that he covered the three futures sold in the previous example at a nice profit, possibly 7 points or so. One could also assume that as the puts became in-the-money options, he established a similar hedge and bought three unleaded gasoline futures when the EFP reached –3.00. This probably occurred with unleaded gasoline futures around .5700 – 5 cents in the money.

Assuming that these were the trades, the following table shows the profits and losses.

Position	Initial Price	Final Price	Net Profit/ Loss
Bought 5 calls	6.40	0	–$13,440
Bought 5 puts	4.25	10.00	+ 12,075
Sold 3 heating oil futures	.7100	.6400	+ 8,820
Bought 3 unleaded gas futures	.5700	.5200	– 6,300
Total profit:			+$ 1,155

In the final analysis, the fact that the intermarket spread collapsed to zero actually aided the option strategy, since the puts were the in-the-money option at expiration. This was not planned, of course, but by being long the options, the strategist was able to make money when volatility appeared.

INTRAMARKET SPREAD STRATEGY

It should be obvious that the same strategy could be applied to an intramarket spread as well. If one is thinking of spreading two different soybean futures, for example, he could substitute in-the-money options for futures in the position. He would have the same attributes as shown for the intermarket spread: large potential profits if volatility occurs. Of course, he could still make money if the intramarket spread widens, but he would lose the time value premium paid for the options.

SPREADING FUTURES AGAINST STOCK SECTOR INDICES

This concept can be carried one step further. Many futures contracts are related to stocks – usually to a sector of stocks dealing in a particular commodity. For example, there are crude oil futures and there is an Oil & Gas Sector Index (XOI). There are gold futures and there is a Gold & Silver Index (XAU). If one charts the history of the commodity versus the price of the stock sector, he can often find tradeable patterns in terms of the relationship between the two. That relationship can be traded via an intermarket spread using options.

For example, if one thought crude oil was cheap with respect to the price of oil stocks in general, he could buy calls on crude oil futures and buy puts on the Oil & Gas (XOI) Index. One would have to be certain to determine the number of options to trade on each side of the spread, by using the ratio that was presented in Chapter 31 on inter-index spreading. (In fact, this formula should be used for futures intermarket spreading if the two underlying futures don't have the same terms.) Only now, there is an extra component to add if options are used – the delta of the options:

$$\text{Ratio} = \frac{v_1}{v_2} \times \frac{p_1}{p_2} \times \frac{u_1}{u_2} \times \frac{\Delta_1}{\Delta_2}$$

where v_i = volatility

p_i = price of the underlying

u_i = unit of trading of the option

Δ_i = delta of the option

Example: Suppose that one indeed wants to buy crude oil calls and also buy puts on the XOI Index because he thinks that crude oil is cheap with respect to oil stocks. The following prices exist:

July crude futures: 16.35	$XOI: 256.50
Crude July 1550 call: 1.10	June 265 put: 14½
Volatility: 25%	Volatility: 17%
Call delta: 0.74	Put delta: 0.73

The unit of trading for XOI options is $100 per point, as it is with nearly all stock and index options. The unit of trading for crude oil futures and options is $1,000 per point. With all of this information, the ratio can be computed:

Crude = $1{,}000 \times 0.25 \times 16.35 \times 0.74$

XOI = $100 \times 0.17 \times 256.50 \times 0.73$

Ratio = Crude / XOI = 0.91

Therefore, one would buy 0.91 XOI put for every 1 crude oil call that he bought. For small accounts, this is essentially a 1-to-1 ratio, but for large accounts, the exact ratio could be used (for example, buy 91 XOI puts and 100 crude oil calls). The resultant quantities encompass the various differences in these two markets – mainly the price and volatility of the underlyings, plus the large differential in their units of trading (100 vs. 1,000).

SUMMARY

Futures spreading is a very important and potentially profitable endeavor. Utilizing options in these spreads can often improve profitability to the point that an originally mistaken assumption can be overcome by volatility of price movement.

Futures spreads fall into two categories – intermarket and intramarket. They are important strategies because many futures exhibit historic and/or seasonal tendencies that can be traded without regard to the overall movement of futures prices.

Options can be used to enhance these futures spreading strategies. The futures calendar spread is closely related to the intramarket spread. It is distinctly different from the stock or index option calendar spread.

Using in-the-money long option combinations in lieu of futures can be a very attractive strategy for either intermarket or intramarket spreads. The option strategy gives the spreader two ways to make money: (1) from the movement of the underlying futures in the spread; or (2) if the futures prices experience a big move, from the fact that one option can continually increase in value while the other can drop only to zero. The option strategy also affords the strategist the opportunity for follow-up action based on the equivalent futures position that accumulates as prices rise or fall.

The concepts introduced in this chapter apply not only to futures spreads, but to intermarket spreads between any two entities. An example was given of an intermarket spread between futures and a stock sector index, but the concept can be generalized to apply to any two related markets of any sort.

Traders who utilize futures spreads as part of their trading strategy should give serious consideration to substituting options when applicable. Such an alternative strategy will often improve the chances for profit.

PART VI

Measuring and Trading Volatility

Even though a myriad of strategies and concepts have been presented so far, a common thread among them is lacking. The one thing that ties all option strategies together and allows one to make comparative decisions is *volatility.* In fact, volatility is the most important concept in option trading. Oh, sure, if you're a great picker of stocks, then you *might* be able to get by without considering volatility. Even then, though, you'd be operating without full consideration of the main factor influencing option prices and strategy. For the rest of us, it is mandatory that we consider volatility carefully before deciding what strategy to use. In this section of the book, an extensive treatment of volatility and volatility trading is presented. The first part defines the terms and discusses some general concepts about how volatility can – and *should* – be used. Then, a number of the more popular strategies, described earlier in the book, are discussed from the vantage point of how they perform when implied volatilities change. After that, volatility trading strategies are discussed – and these are some of the most important concepts for option traders. A discussion is presented of how stock prices actually behave, as opposed to how investors *perceive* them to behave, and then specific criteria and methodology for both buying and selling volatility are introduced.

The information to be presented here is not overly theoretical. All of the concepts should be understandable by most option traders. Whether or not one chooses to actually "trade volatility," it is nevertheless important for an option trader to understand the concepts that underlie the basic principles of volatility trading.

WHY TRADE "THE MARKET"?

The "game" of stock market predicting holds appeal for many because one who can do it seems powerful and intelligent. Everyone has his favorite indicators, analysis techniques, or "black box" trading systems. But can the market really be predicted? And if it can't, what does that say about the time spent trying to predict it? The answers to these questions are not clear, and even if one were to prove that the market can't be predicted, most traders would refuse to believe it anyway. In fact, there may be more than one way to "predict" the market, so in a certain sense one has to qualify exactly what he is talking about before it can be determined if the market can be predicted or not.

The astute option trader knows that market prediction falls into two categories: (1) the prediction of the short-term movement of prices, and (2) the prediction of volatility of the underlying. These are not independent predictions. For example, anyone who is using a "target" is trying to predict *both.* That's pretty hard. Not only do you have to be right about the direction of prices, but you also have to be able to

predict how volatile the underlying is going to be so that you can set a reasonable target. In certain cases, the first prediction can be made with some degree of accuracy, but the second one is extremely difficult.

Nearly every trader uses something to aid him in determining what to buy and when to buy it. Many of these techniques, especially if they are refined to a trading *system,* seem worthwhile. In that sense, it appears that the market *can* be predicted. However, this type of predicting usually involves a lot of work, including not only the initial selection of the position, but money management in determining position size, risk management in placing and watching (trailing) stops, and so on. Thus, it's not easy.

To make matters even worse, most mathematical studies have shown that the market can't really be predicted. They tend to imply that anyone who is outperforming an index fund is merely "hot" – has hit a stream of winners. Can this possibly be true? Consider this example. Have you ever gone to Las Vegas and had a winning day? How about a weekend? What about a week? You might be able to answer "yes" to all of those, even though you know for a certainty that the casino odds are mathematically stacked against you. What if the question were extended to your lifetime: Are you ahead of the casinos for your entire life? *This* answer is most certainly "no" if you have played for any reasonably long period of time.

Mathematicians have tended to believe that outperforming the broad stock market is just about the same as beating the casinos in Las Vegas – possible in the short term, but virtually impossible in the long term. Thus, when mathematicians say that the stock market can't be predicted, they are talking about consistently beating the "index" – say, the S&P 500 – over a long period of time.

Those with an opposing viewpoint, however, say that the market *can* be beat. They say the "game" is more like poker – where a good player can be a consistent winner through money management techniques – than like casino gambling, where the odds are fixed. It would be impossible to get everyone to agree for sure on who is right. There's some credibility in both viewpoints, but just as it's very hard to be a good poker player, so it is difficult to beat the market consistently with directional strategies. Moreover, even the best directional traders know that there are large swings or drawdowns in one's net worth during the year. Thus, the *consistency* of returns is generally erratic for the directional trader.

This inconsistency of returns, the amount of work required, and the necessity to have sufficient capital and to manage it well are all factors that can lead to the demise of a directional trader. As such, short-term directional trading probably is not really a "comfortable" trading strategy for most traders – and if one is trading a strategy that he is not comfortable with, he is eventually going to lose money doing it.

So, is there a better alternative? Or should one just pack it in, buy some index funds, and forget it? As an option strategist, one should most certainly believe that there's something better than buying the index fund. The alternative of volatility trading offers significant advantages in terms of the factors that make directional trading difficult.

If one finds that he *is* able to handle the rigors of directional trading, then stick with that approach. You might want to add some volatility trading to your arsenal, though, just to be safe. However, if one finds that directional trading is just too time-consuming, or you have trouble utilizing stops properly, or are constantly getting whipsawed, then it's time to concentrate more heavily on volatility trading, preferably in the form of straddle buying.

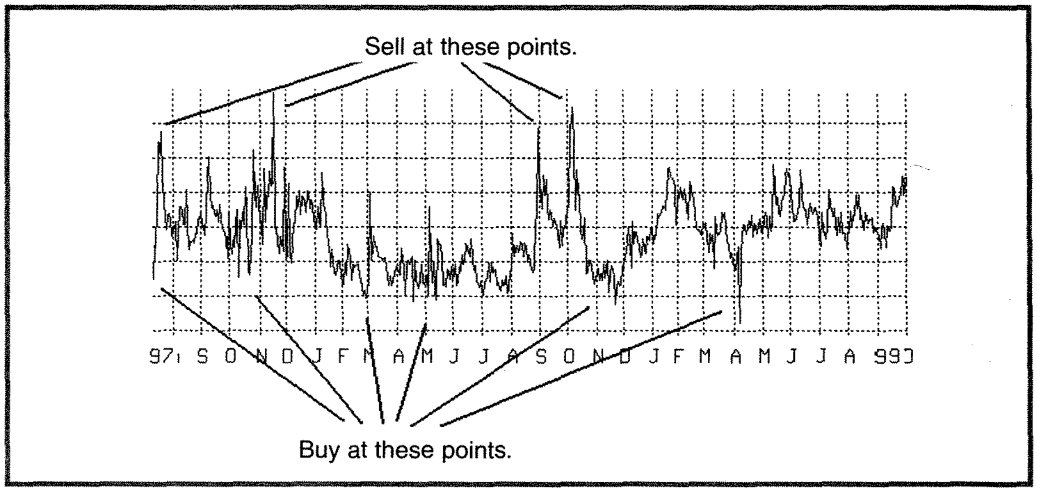
CHAPTER 36

The Basics of Volatility Trading

Volatility trading first attracted mathematically oriented traders who noticed that the market's prediction of forthcoming volatility – for example, implied volatility – was substantially out of line with what one might reasonably expect should happen. Moreover, many of these traders (market-makers, arbitrageurs, and others) had found great difficulties with keeping a "delta neutral" position neutral. Seeking a better way to trade without having a market opinion on the underlying security, they turned to volatility trading. This is not to suggest that volatility trading eliminates all market risk, turning it all into volatility risk, for example. But it does suggest that a certain segment of the option trading population can handle the risk of volatility with more deference and aplomb than they can handle price risk.

Simply stated, it seems like a much easier task to predict volatility than to predict prices. That is said notwithstanding the great bull market of the 1990s, in which every investor who strongly participated certainly feels that *he* understands how to predict prices. Remember not to confuse brains with a bull market. Consider the chart in Figure 36-1. This seems as if it might be a good stock to trade: Buy it near the lows and sell it near the highs, perhaps even selling it short near the highs and covering when it later declines. It appears to have been in a trading range for a long time, so that after each purchase or sale, it returns at least to the midpoint of its trading range and sometimes even continues on to the other side of the range. There is no scale on the chart, but that doesn't change the fact that it appears to be a tradable entity. In fact, this is a chart of *implied volatility* of the options on a major U.S. corporation. It really doesn't matter which one (it's IBM), because the implied volatility chart of nearly every stock, index, or futures contract has a similar pattern – a trading range. The only time that implied volatility will totally break out of its "normal" range is if something material happens to change the fundamentals of the way the stock moves – a takeover bid, for example, or perhaps a major acquisition or other dilution of the stock.

FIGURE 36-1.
A sample chart.



So, many traders observed this pattern and have become adherents of trying to predict volatility. Notice that if one is able to isolate volatility, he doesn't care where the stock price goes – he is just concerned with buying volatility near the bottom of the range and selling it when it gets back to the middle or high end of the range, or vice versa. In real life, it is nearly impossible for a public customer to be able to isolate volatility so specifically. He will have to pay some attention to the stock price, but he still is able to establish positions in which the direction of the stock price is irrelevant to the outcome of the position. This quality is appealing to many investors, who have repeatedly found it difficult to predict stock prices. Moreover, an approach such as this should work in both bull and bear markets. Thus, volatility trading appeals to a great number of individuals. Just remember that, for you *personally* to operate a strategy properly, you must find that it appeals to your own philosophy of trading. Trying to use a strategy that you find uncomfortable will only lead to losses and frustration. So, if this somewhat neutral approach to option trading sounds interesting to you, then read on.

DEFINITIONS OF VOLATILITY

Volatility is merely the term that is used to describe how fast a stock, future, or index changes in price. When one speaks of volatility in connection with options, there are two types of volatility that are important. The first is *historical volatility,* which is a measure of how fast the underlying instrument *has been* changing in price. The other is *implied volatility,* which is the option market's *prediction* of the volatility of the

underlying over the life of the option. The computation and comparison of these two measures can aid immensely in predicting the forthcoming volatility of the underlying instrument – a crucial matter in determining today's option prices.

Historical volatility can be measured with a specific formula, as shown in the chapter on mathematical applications. It is merely the formula for standard deviation as contained in most elementary books on statistics. The important point to understand is that it is an exact calculation, and there is little debate over how to compute historical volatility. It is not important to know what the actual measurement means. That is, if one says that a certain stock has a historical volatility of 20%, that by itself is a relatively meaningless number to anyone but an ardent statistician. However, it *can* be used for comparative purposes.

The standard deviation is expressed as a percent. One can determine that the historical volatility of the broad stock market has usually been in the range of 15% to 20%. A very volatile stock might have an historical volatility in excess of 100%. These numbers can be compared to each other, so that one might say that a stock with the latter historical volatility is five times more volatile that the "stock market." So, the historical volatility of one instrument can be compared with that of another instrument in order to determine which one is more volatile. That in itself is a useful function of historical volatility, but its uses go much farther than that.

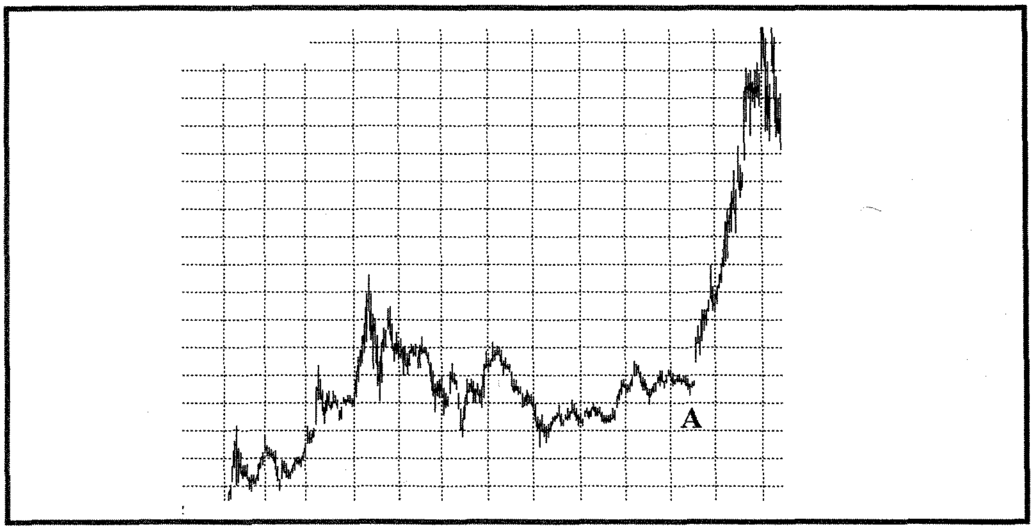
Historical volatility can be measured over different time periods to give one a sense of how volatile the underlying has been over varying lengths of time. For example, it is common to compute a 10-day historical volatility, as well as a 20-day, 50-day, and even 100-day. In each case, the results are annualized so that one can compare the figures directly.

Consider the chart in Figure 36-2. It shows a stock (although it could be a futures contract or index, too) that was meandering in a rather tight range for quite some time. At the point marked "A" on the chart, it was probably at its least volatile. At that time, the 10-day volatility might have been something quite low, say 20%. The price movements directly preceding point A had been very small. However, prior to that time the stock had been more volatile, so longer-term measures of the historical volatility would shown higher numbers. The possible measures of historical volatility, then *at point A*, might have been something like:

10-day historical volatility: 20%
20-day historical volatility: 23%
50-day historical volatility: 35%
100-day historical volatility: 45%

A pattern of historical volatilities of this sort describes a stock that has been slowing down lately.

FIGURE 36-2.
Sample stock chart.



Its price movements have been less extreme in the near term.

Again referring to Figure 36-2, note that shortly after point A, the stock jumped much higher over a short period of time. Price action like this increases the implied volatility dramatically. And, at the far right edge of the chart, the stock had stopped rising but was swinging back and forth in far more rapid fashion than it had been at most other points on the chart. Violent action in a back-and-forth manner can often produce a higher historical volatility reading that straight-line move can; it's just the way the numbers work out. So, by the far right edge of the chart, the 10-day historical volatility would have increased rather dramatically, while the longer-term measures wouldn't be so high because they would still contain the price action that occurred prior to point A.

At the far right edge of Figure 36-2, these figures might apply:

10-day historical volatility: 80%
20-day historical volatility: 75%
50-day historical volatility: 60%
100-day historical volatility: 55%

With this alignment of historical volatilities, one can see that the stock has been more volatile recently than in the more distant past. In Chapter 38 on the distribution of stock prices, we will discuss in some detail just which one, if any, of these historical volatilities one should use as *"the"* historical volatility input into option and

probability models. We need to be able to make volatility estimates in order to determine whether or not a strategy might be successful, and to determine whether the current option price is a relatively cheap one or a relatively expensive one. For example, one can't just say, "I think XYZ is going to rise at least 18 points by February expiration." There needs to be some basis in fact for such a statement and, lacking inside information about what the company might announce between now and February, that basis should be statistics in the form of volatility projections.

Historical volatility is, of course, useful as an input to the (Black-Scholes) option model. In fact, the volatility input to any model is crucial because the volatility component is such a major factor in determining the price of an option. Furthermore, historical volatility is useful for more than just estimating option prices. It is necessary for making stock price projections and calculating distributions, too, as will be shown when those topics are discussed later. Any time one asks the question, "What is the probability of the stock moving from here to there, or of exceeding a particular target price?" the answer is heavily dependent on the volatility of the underlying stock (or index or futures).

It is obvious from the above example that historical volatility can change dramatically for any particular instrument. Even if one were to stick with just one measure of historical volatility (the 20-day historical is commonly the most popular measure), it changes with great frequency. Thus, one can never be certain that basing option price predictions or stock price distributions on the current historical volatility will yield the "correct" results. Statistical volatility may change as time goes forward, in which case your projections would be incorrect. Thus, it is important to make projections that are on the conservative side.

ANOTHER APPROACH: GARCH

GARCH stands for ***Generalized Autoregressive Conditional Heteroskedasticity***, which is why it's shortened to GARCH. It is a technique for forecasting volatility that some analysts say produces better projections than using historical volatility alone or implied volatility alone. GARCH was created in the 1980s by specialists in the field of econometrics. It incorporates both historical and implied volatility, plus one can throw in a constant ("fudge factor"). In essence, though, the user of GARCH volatility models has to make some predictions or decisions about the weighting of the factors used for the estimate. By its very nature, then, it can be just as vague as the situations described in the previous section.

The model can "learn," though, if applied correctly. That is, if one makes a volatility prediction for today (using GARCH, let's say), but it turns out that the actu-

al volatility was lower, then when you make the volatility prediction for tomorrow, you'll probably want to adjust it downward, using the experience of the real world, where you see volatility declining. This also incorporates the common-sense notion that volatility tends to remain the same; that is, tomorrow's volatility is likely to be much like today's. Of course, that's a little bit like saying tomorrow's weather is likely to be the same as today's (which it is, two-thirds of the time, according to statistics). It's just that when a tornado hits, you have to realize that your forecast could be wrong. The same thing applies to GARCH volatility projections. They can be wrong, too.

So, GARCH does not do a perfect job of estimating and forecasting volatility. In fact, it might not even be superior, from a strategist's viewpoint, to using the simple minimum/maximum techniques outlined in the previous section. It is really best geared to predicting short-term volatility and is favored most heavily by dealers in currency options who must adjust their markets constantly. For longer-term volatility projections, which is what a *position trader* of volatility is interested in, GARCH may not be all that useful. However, it is considered state-of-the-art as far as volatility predicting goes, so it has a following among theoretically oriented traders and analysts.

MOVING AVERAGES

Some traders try to use moving averages of daily composite implied volatility readings, or use a smoothing of recent past historical volatility readings to make volatility estimates. As mentioned in the chapter on mathematical applications, once the composite daily implied volatility has been computed, it was recommended that a smoothing effect be obtained by taking a moving average of the 20 or 30 days' implied volatilities. In fact, an *exponential* moving average was recommended, because it does not require one to keep accessing the last 20 or 30 days' worth of data in order to compute the moving average. Rather, the most recent exponential moving average is all that's needed in order to compute the next one.

IMPLIED VOLATILITY

Implied volatility has been mentioned many times already, but we want to expand on its concept before getting deeper into its measure and uses later in this section. Implied volatility pertains only to options, although one can aggregate the implied volatilities of the various options trading on a particular underlying instrument to produce a single number, which is often referred to as the implied volatility of the underlying.

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At any one point in time, a trader knows for certain the following items that affect an option's price: stock price, strike price, time to expiration, interest rate, and dividends. The only remaining factor is volatility – in fact, *implied* volatility. It is the big "fudge factor" in option trading. If implied volatility is too high, options will be overpriced. That is, they will be relatively expensive. On the other hand, if implied volatility is too low, options will be cheap or underpriced. The terms "overpriced" and "underpriced" are not really used by theoretical option traders much anymore, because their usage implies that one knows what the option *should* be worth. In the modern vernacular, one would say that the options are trading with a "high implied volatility" or a "low implied volatility," meaning that one has some sense of where implied volatility has been in the past, and the current measure is thus high or low in comparison.

Essentially, implied volatility is the option market's guess at the forthcoming statistical volatility of the underlying over the life of the option in question. If traders believe that the underlying will be volatile over the life of the option, then they will bid up the option, making it more highly priced. Conversely, if traders envision a non-volatile period for the stock, they will not pay up for the option, preferring to bid lower; hence the option will be relatively low-priced. The important thing to note is that traders normally do *not* know the future. They have no way of knowing, for sure, how volatile the underlying is going to be during the life of the option.

Having said that, it would be unrealistic to assume that inside information does not leak into the marketplace. That is, if certain people possess nonpublic knowledge about a company's earnings, new product announcement, takeover bid, and so on, they will aggressively buy or bid for the options and that will increase implied volatility. So, in certain cases, when one sees that implied volatility has shot up quickly, it is perhaps a signal that some traders do indeed know the future – at least with respect to a specific corporate announcement that is about to be made.

However, most of the time there is not anyone trading with inside information. Yet, every option trader – market-maker and public alike – is forced to make a "guess" about volatility when he buys or sells an option. That is true because the price he pays is heavily influenced by his volatility estimate (whether or not he realizes that he is, in fact, making such a volatility estimate). As you might imagine, most traders have no idea what volatility is going to be during the life of the option. They just pay prices that seem to make sense, perhaps based on historic volatility. Consequently, today's implied volatility may bear no resemblance to the actual statistical volatility that later unfolds during the life of the option.

For those who desire a more mathematical definition of implied volatility, consider this.

Opt price = *f*(Stock price, Strike price, Time, Risk-free rate, Volatility, Dividends)

Furthermore, suppose that one knows the following information:

XYZ price: 52
April 50 call price: 6
Time remaining to April expiration: 36 days
Dividends: $0.00
Risk-free interest rate: 5%

This information, which is available for every option at any time, simply from an option quote, gives us everything except the implied volatility. So what volatility would one have to plug in the Black–Scholes model (or whatever model one is using) to make the model give the answer 6 (the current price of the option)? That is, what volatility is necessary to solve the equation?

6 = *f*(52, 50, 36 days, 5%, Volatility, $0.00)

Whatever volatility is necessary to make the model yield the current market price (6) as its value, is the implied volatility for the XYZ April 50 call. In this case, if you're interested, the implied volatility is 75.4%. The actual process of determining implied volatility is an iterative one. There is no formula, per se. Rather, one keeps trying various volatility estimates in the model until the answer is close enough to the market value.

THE VOLATILITY OF VOLATILITY

In order to discuss the implied volatility of a particular entity – stock, index, or futures contract – one generally refers to the implied volatility of individual options or perhaps the composite implied volatility of the entire option series. This is generally good enough for strategic comparisons. However, it turns out that there might be other ways to consider looking at implied volatility. In particular, one might want to consider how wide the *range* of implied volatility is – that is, how volatile the individual implied volatility numbers are.

It is often conventional to talk about the *percentile of implied volatility.* That is a way to rank the current implied volatility reading with past readings for the same underlying instrument.

However, a fairly important ingredient is missing when percentiles are involved. One can't really tell if "cheap" options are cheap as a practical matter. That's because one doesn't know how tightly packed together the past implied volatility readings are. For example, if one were to discover that the entire past range of implied volatility for XYZ stretched only from 39% to 45%, then a current reading of 40%, while low,

might not seem all that attractive. That is, if the first percentile of XYZ options were at an implied volatility reading of 39% and the 100th percentile were at 45%, then a reading of 40% is really quite mundane. There just wouldn't be much room for implied volatility to increase on an absolute basis. Even if it rose to the 100th percentile, an individual XYZ option wouldn't gain much value, because its implied volatility would only be increasing from about 40% to 45%.

However, if the distribution of past implied volatility is *wide,* then one can truly say the options are cheap if they are currently in a low percentile. Suppose, rather than the tight range described above, that the range of past implied volatilities for XYZ instead stretched from 35% to 90% – that the first percentile for XYZ implied volatility was at 35% and the 100th percentile was at 90%. Now, if the current reading is 40%, there is a large range above the current reading into which the options could trade, thereby potentially increasing the value of the options if implied volatility moved up to the higher percentiles.

What this means, as a practical matter, is that one not only needs to know the current percentile of implied volatility, but he also needs to know the *range* of numbers over which that percentile was derived. If the range is wide, then an extreme percentile truly represents a cheap or expensive option. But if the range is tight, then one should probably not be overly concerned with the current percentile of implied volatility.

Another facet of implied volatility that is often overlooked is how it ranges with respect to the time left in the option. This is particularly important for traders of LEAPS (long-term) options, for the range of implied volatility of a LEAPS option will not be as great as that of a short-term option. In order to demonstrate this, the implied volatilities of $OEX options, both regular and LEAPS, were charted over several years. The resulting scatter diagram is shown in Figure 36-3.

Two curved lines are drawn on Figure 36-3. They contain most of the data points. One can see from these lines that the range of implied volatility for near-term options is greater than it is for longer-term options. For example, the implied volatility readings on the far left of the scatter diagram range from about 14% to nearly 40% (ignore the one outlying point). However, for longer-term options of 24 months or more, the range is about 17% to 32%. While $OEX options have their own idiosyncracies, this scatter diagram is fairly typical of what we would see for any stock or index option.

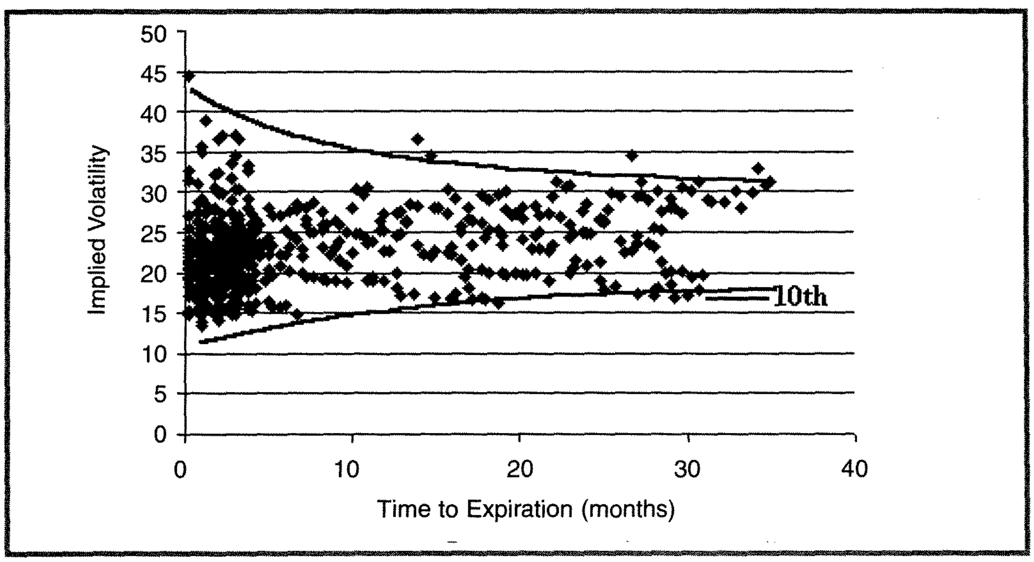
One conclusion that we can draw from this is that LEAPS option implied volatilities just don't change nearly as much as those of short-term options. That can be an important piece of information for a LEAPS option trader especially if he is comparing the LEAPS implied volatility with a *composite* implied volatility or with the *historical* volatility of the underlying.

Once again, consider Figure 36-3. While it is difficult to discern from the graph alone, the 10th percentile of $OEX composite implied volatility, using all of the data points given, is 17%. The line that marks this level (the tenth percentile) is noted on the right side of the scatter diagram. It is quite easy to see that the LEAPS options rarely trade at that low volatility level.

In Figure 36-3, the distance between the curved lines is much greater on the left side (i.e., for shorter-term options) than it is on the right side (for longer-term options). Thus, it's difficult for the longer-term options to register either an extremely high or extremely low implied volatility reading, when *all* of the options are considered. Consequently, LEAPS options will rarely appear "cheap" when one looks at their percentile of implied volatility, including all the short-term options, too.

One might say that, if he were going to buy long-term options, he should look only at the size of the volatility range on the right side of the scatter diagram. Then, he could make his decision about whether the options are cheap or not by only comparing the current reading to past readings of long-term options. This line of thinking, though, is somewhat fallacious reasoning, for a couple of reasons: First, if one holds the option for any long period of time, the volatility range will widen out and there is a chance that implied volatility could drop substantially. Second, the long-term volatility range might be so small that, even though the options are initially cheap, quick increase in implied volatility over several deciles might not translate into much of a gain in price in the short term.

FIGURE 36-3. Implied volatilities of $OEX options over several years.



It's important for anyone using implied volatility in his trading decisions to understand that the range of past implied volatilities is important, and to realize that the volatility range expands as time shrinks.

IS IMPLIED VOLATILITY A GOOD PREDICTOR OF ACTUAL VOLATILITY?

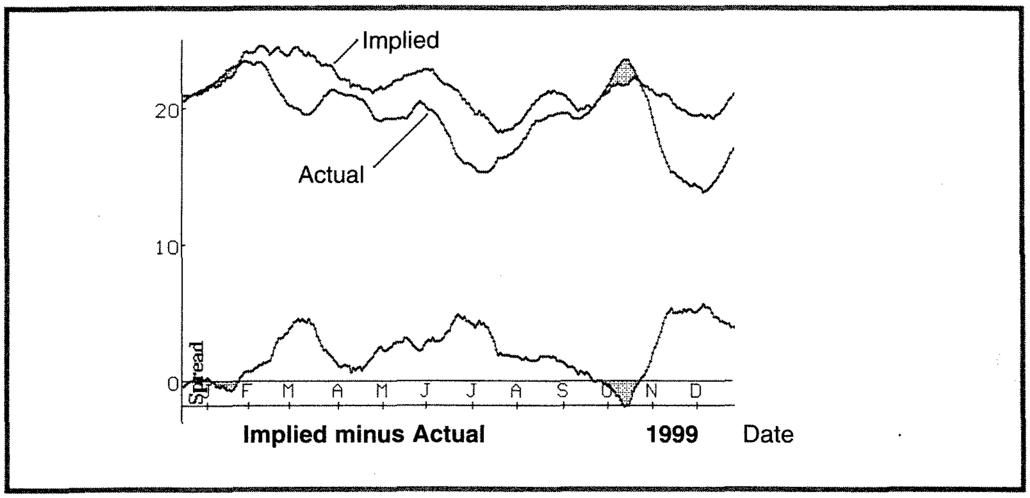
The fact that one can calculate implied volatility does not mean that the calculation is a good estimate of forthcoming volatility. As stated above, the marketplace does not really know how volatile an instrument is going to be, any more than it knows the forthcoming price of the stock. There are clues, of course, and some general ways of estimating forthcoming volatility, but the fact remains that sometimes options trade with an implied volatility that is quite a bit out of line with past levels. Therefore, implied volatility may be considered to be an inaccurate estimate of what is really going to happen to the stock during the life of the option. Just remember that implied volatility is a forward-looking estimate, and since it is based on traders' suppositions, it can be wrong – just as any estimate of future events can be in error.

The question posed above is one that should probably be asked more often than it is: "Is implied volatility a good predictor of actual volatility?" Somehow, it seems logical to assume that implied and historical (actual) volatility will converge. That's not really true, at least not in the short term. Moreover, even if they *do* converge, which one was right to begin with – implied or historical? That is, did implied volatility move to get more in line with actual movements of the underlying, or did the stock's movement speed up or slow down to get in line with implied volatility?

To illustrate this concept, a few charts will be used that show the comparison between implied and historical volatility. Figure 36-4 shows information for the $OEX Index. In general, $OEX options are overpriced. See the discussion in Chapter 29. That is, implied volatility of $OEX options is almost always higher than what actual volatility turns out to be. Consider Figure 36-4. There are three lines in the figure: (a) implied volatility, (b) actual volatility, and (c) the difference between the two. There is an important distinction here, though, as to what comprises these curves:

(a) The implied volatility curve depicts the 20-day moving average of daily composite implied volatility readings for $OEX. That is, each day one number is computed as a composite implied volatility for $OEX for that day. These implied volatility figures are computed using the averaging formula shown in the chapter on mathematical applications, whereby each option's implied volatility is weighted by trading volume and by distance in- or out-of-the-money, to arrive at a single composite implied volatility reading for the trading day. To smooth out those daily readings, a 20-day simple moving average is used. This daily implied volatil-

FIGURE 36-4.
$OEX implied versus historical volatility.



ity of $OEX options encompasses *all* the $OEX options, so it is different from the Volatility Index ($VIX), which uses only the options closest to the money. By using all of the options, a slightly different volatility figure is arrived at, as compared to $VIX, but a chart of the two would show similar patterns. That is, peaks in implied volatility computed using all of the $OEX options occur at the same points in time as peaks in $VIX.

(b) The *actual* volatility on the graph is a little different from what one normally thinks of as historical volatility. It is the 20-day historical volatility, computed 20 days *later* than the date of the implied volatility calculation. Hence, points on the implied volatility curve are matched with a 20-day historical volatility calculation *that was made 20 days later.* Thus, the two curves more or less show the prediction of volatility and what actually happened over the 20-day period. These actual volatility readings are smoothed as well, with a 20-day moving average.

(c) The difference between the two is quite simple, and is shown as the bottom curve on the graph. A "zero" line is drawn through the difference.

When this "difference line" passes through the zero line, the projection of volatility and what actually occurred 20 days later were equal. If the difference line is above the zero line, then implied volatility was too high; the options were overpriced. Conversely, if the difference line is below the zero line, then actual volatility turned out to be greater than implied volatility had anticipated. The options were underpriced in that case. Those latter areas are shaded in Figure 36-4. Simplistically, you would want to own options during the shaded periods on the chart, and would want to be a seller of options during the non-shaded areas.

Note that Figure 36-4 indeed confirms the fact that $OEX options are consistently overpriced. Very few charts are as one-dimensional as the $OEX chart, where the options were so consistently overpriced. Most stocks find the difference line oscillating back and forth about the zero mark. Consider Figures 36-5 and 36-6. Figure 36-5 shows a chart similar to Figure 36-4, comparing actual and implied volatility, and their difference, for a particular stock. Figure 36-6 shows the price graph of that same stock, overlaid on implied volatility, during the period up to and including the heavy shading.

The volatility comparison chart (Figure 36-5) shows several shaded areas, during which the stock was more volatile than the options had predicted. Owners of options profited during these times, provided they had a more or less neutral outlook on the stock. Figure 36-6 shows the stock's performance up to and including the March–April 1999 period – the largest shaded area on the chart. Note that implied volatility was quite low before the stock made the strong move from 10 to 30 in little more than a month. These graphs are taken from actual data and demonstrate just how badly out of line implied volatility can be. In February and early March 1999, implied volatility was at or near the lowest levels on these charts. Yet, by the end of March, a major price explosion had begun in the stock, one that tripled its value in just over a month. Clearly, implied volatility was a poor predictor of forthcoming actual volatility in this case.

What about later in the year? In Figure 36-5, one can observe that implied and actual volatility oscillated back and forth quite a few times during the rest of 1999. It might appear that these oscillations are small and that implied volatility was actually doing a pretty good job of predicting actual volatility, at least until the final spike in December 1999. However, looking at the scale on the left-hand side of Figure 36-5, one can see that implied volatility was trying to remain in the 50% to 60% range, but actual volatility kept bolting higher rather frequently.

One more example will be presented. Figures 36-7 and 36-8 depict another stock and its volatilities. On the left half of each graph, implied volatility was quite high. It was higher than actual volatility turned out to be, so the difference line in Figure 36-7 remains above the zero line for several months. Then, for some reason, the option market decided to make an adjustment, and implied volatility began to drop. Its lowest daily point is marked with a circle in Figure 36-8, and the same point in time is marked with a similar circle in Figure 36-7. At that time, options traders were "saying" that they expected the stock to be very tame over the ensuing weeks. Instead, the stock made two quick moves, one from 15 down to 11, and then another back up to 17. That movement jerked actual volatility higher, but implied volatility remained rather low. After a period of trading between 13 and 15, during which time implied volatility remained low, the stock finally exploded to the upside, as evidenced by the spikes on the right-hand side of both Figures 36-7 and 36-8. Thus,

FIGURE 36-5.
Implied versus historical volatility of a stock.

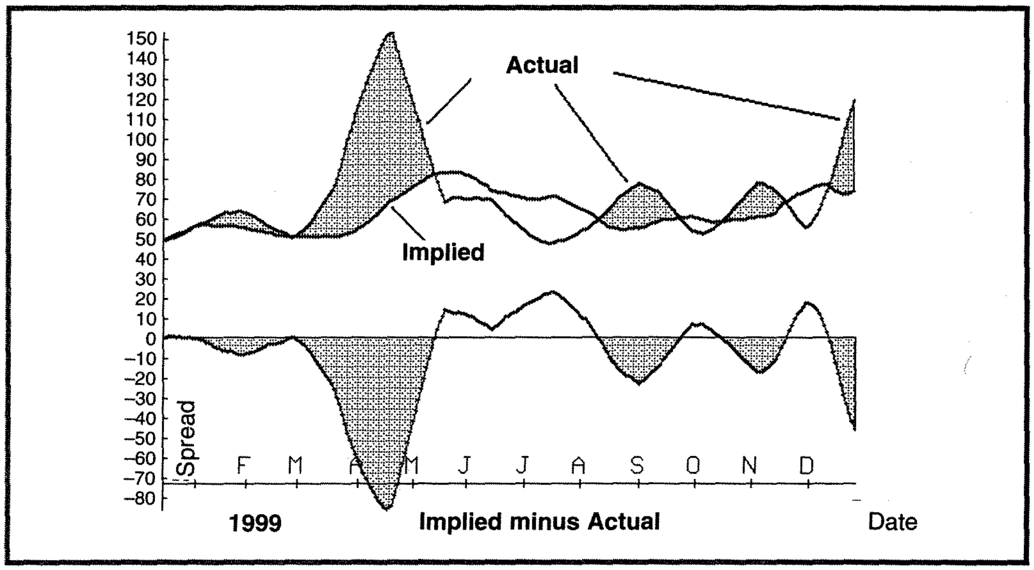


FIGURE 36-6.
The price graph of the stock.

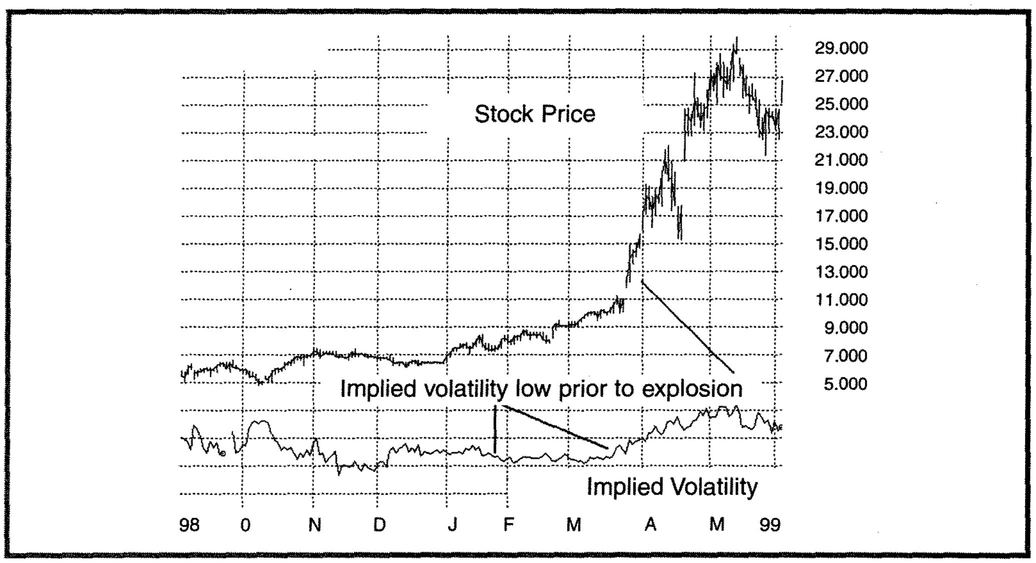


FIGURE 36-7.
Implied versus historical volatility of a stock.

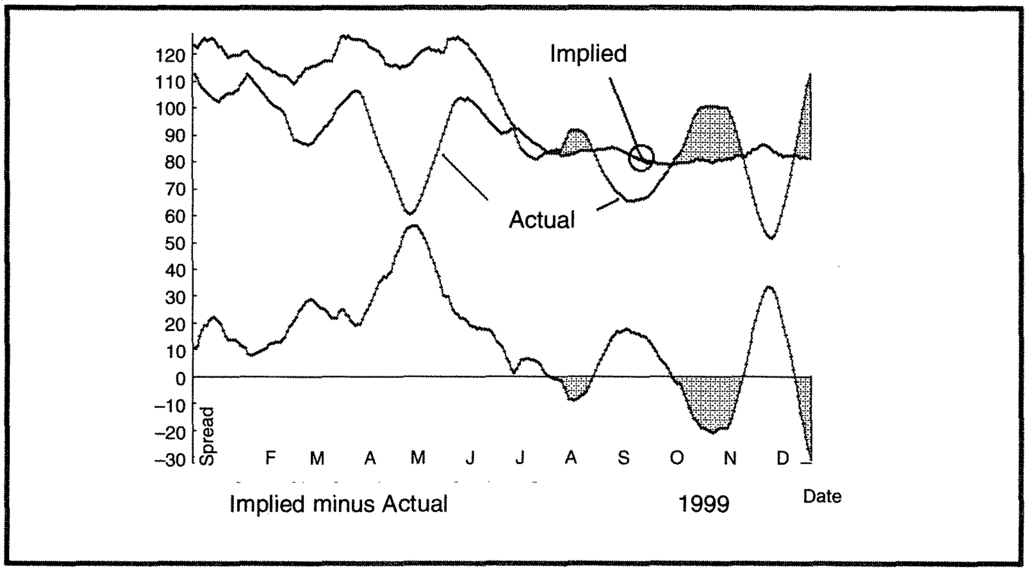
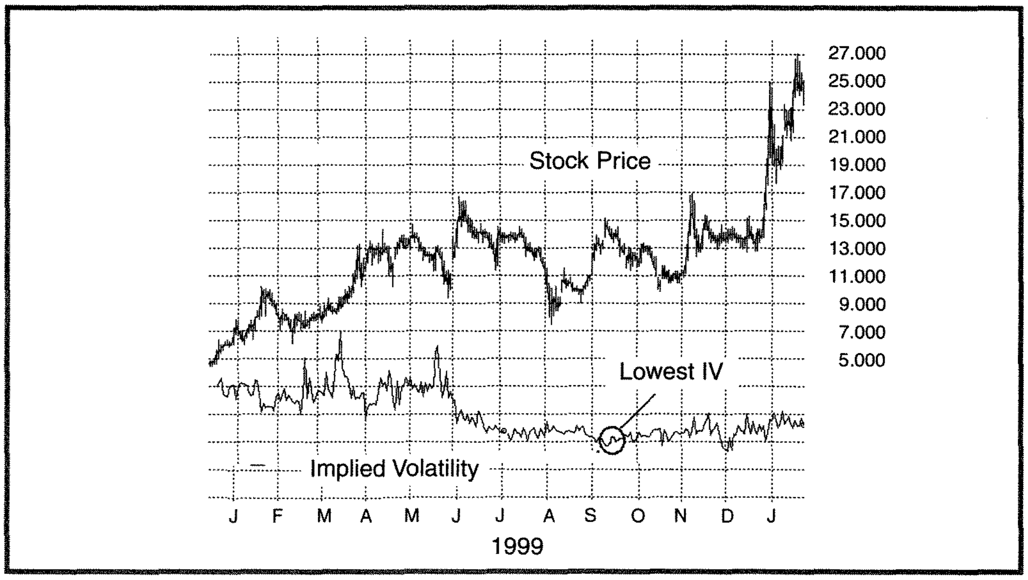


FIGURE 36-8.
The price graph of the stock.



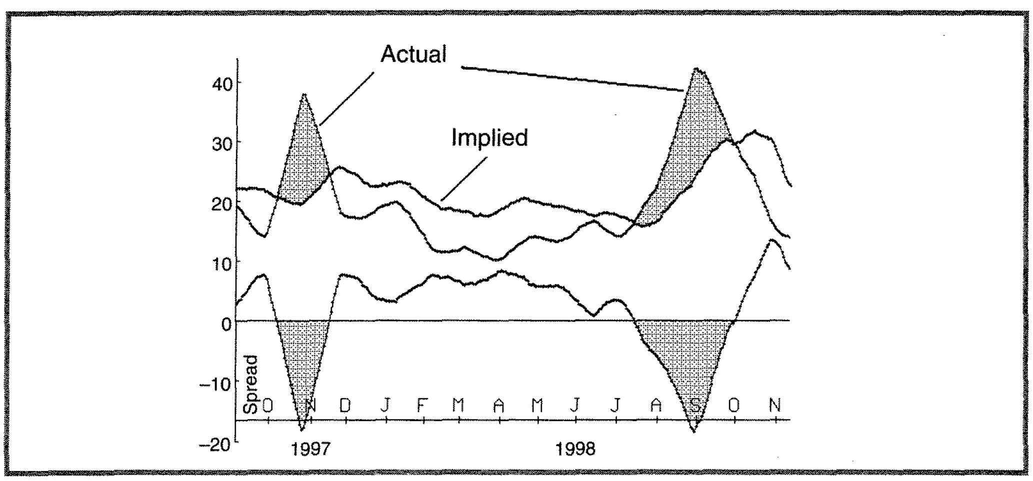
implied volatility was a poor predictor of actual volatility for most of the time on these graphs. Moreover, implied volatility remained low at the right-hand side of the charts (January 2000) even though the stock doubled in the course of a month.

The important thing to note from these figures is that they clearly show that implied volatility is really not a very good predictor of the actual volatility that is to follow. If it were, the difference line would hover near zero most of the time. Instead, it swings back and forth wildly, with implied volatility over- or underestimating actual volatility by quite wide levels. Thus, the current estimates of volatility by traders (i.e., implied volatility) can actually be quite wrong.

Conversely, one could also say that historical volatility is not a great predictor of volatility that is to follow, either, especially in the short term. No one really makes any claims that it is a good predictor, for historical volatility is merely a reflection of what has happened in the past. All we can say for sure is that implied and historical volatility tend to trade within a range.

One thing that does stand out on these charts is that implied volatility seems to fluctuate *less* than actual volatility. That seems to be a natural function of the volatility predictive process. For example, when the market collapses, implied volatilities of options rise only modestly. This can be observed by again referring to Figure 36-4, the $OEX option example. The only shaded area on the graph occurred when the market had a rather sharp sell-off during October 1999. In previous years, when there had been even more severe market declines (October 1997 or August–October 1998) $OEX actual volatility had briefly moved above implied volatility (this data for 1997 and 1998 is shown in Figure 36-9). In other words, option traders and market-makers are predicting volatility when they price options, and one tends to make a

FIGURE 36-9.
$OEX implied versus historical volatility, 1997–1998.



prediction that is somewhat "middle of the road," since an extreme prediction is more likely to be wrong. Of course, it turns out to be wrong anyway, since actual volatility jumps around quite rapidly.

The few charts that have been presented here don't constitute a rigorous study upon which to draw the conclusion that implied volatility is a poor predictor of actual volatility, but it is this author's firm opinion that that statement is true. A graduate student looking for a master's thesis topic could take it from here.

VOLATILITY TRADING

As a result of the fact that implied volatility can sometimes be at irrational extremes, options may sometimes trade with implied volatilities that are significantly out of line with what one would normally expect. For example, suppose a stock is in a relatively nonvolatile period, like the price of the stock in Figure 36-2, just before point A on the graph. During that time, option sellers would probably become more aggressive while option buyers, who probably have been seeing their previous purchases decaying with time, become more timid. As a result, option prices drop. Alternatively stated, implied volatility drops. When implied volatilities are decreasing, option sellers are generally happy (and may often become more aggressive), while option buyers are losing money (and may often tend to become more timid). This is just a function of looking at the profit and loss statements in one's option account. But anyone who took a longer backward look at the volatility of the stock in Figure 36-2 would see that it had been much more volatile in the past. Consequently, he might decide that the implied volatility of the options had gotten too low and he would be a buyer of options.

It is the volatility trader's objective to spot situations when implied volatility is possibly or probably erroneous and to take a position that would profit when the error is brought to light. Thus, the volatility trader's main objective is spotting situations when implied volatility is overvalued or undervalued, irrespective of his outlook for the underlying stock itself. In some ways, this is not so different from the fundamental stock analyst who is attempting to spot overvalued or undervalued stocks, based on earnings and other fundamentals.

From another viewpoint, volatility trading is also a contrarian theory of investing. That is, when everyone else thinks the underlying is going to be nonvolatile, the volatility trader buys volatility. When everyone else is selling options and option buyers are hard to find, the volatility trader steps up to buy options. Of course, some rigorous analysis must be done before the volatility trader can establish new positions, but when those situations come to light, it is most likely that he is taking positions opposite to what "the masses" are doing. He will be buying volatility when the major-

ity has been selling it (or at least, when the majority is refusing to buy it), and he will be selling volatility when everyone else is panicking to buy options, making them quite expensive.

WHY DOES VOLATILITY REACH EXTREMES?

One can't just buy every option that he considers to be cheap. There must be some consideration given to what the probabilities of stock movement are. Even more important, one can't just sell every option that he values as expensive. There may be valid reasons why options become expensive, not the least of which is that someone may have inside information about some forthcoming corporate news (a takeover or an earnings surprise, for example).

Since options offer a good deal of leverage, they are an attractive vehicle to anyone who wants to make a quick trade, especially if that person believes he knows something that the general public doesn't know. Thus, if there is a leak of a takeover rumor – whether it be from corporate officers, investment bankers, printers, or accountants – whoever possesses that information may quite likely buy options aggressively, or at least *bid* for them. Whenever demand for an option outstrips supply – in this case, the major supplier is probably the market-maker – the options quickly get more expensive. That is, implied volatility increases.

In fact, there are financial analysts and reporters who look for large increases in trading volume as a clue to which stocks might be ready to make a big move. Invariably, if the trading volume has increased and if implied volatility has increased as well, it is a good warning sign that someone with inside information is buying the options. In such a case, it might *not* be a good idea to sell volatility, even though the options are mathematically expensive.

Sometimes, even more minor news items are known in advance by a small segment of the investing community. If those items will be enough to move the stock even a couple of points, those who possess the information may try to buy options in advance of the news. Such minor news items might include the resignation or firing of a high-ranking corporate officer, or perhaps some strategic alliance with another company, or even a new product announcement.

The seller of volatility can watch for two things as warning signs that perhaps the options are "predicting" a corporate event (and hence should be avoided as a "volatility sale"). Those two things are a dramatic increase in option volume or a sudden jump in implied volatility of the options. One or both can be caused by traders with inside information trying to obtain a leveraged instrument in advance of the actual corporate news item being made public.

A SUDDEN INCREASE IN OPTION VOLUME OR IMPLIED VOLATILITY

The symptoms of insider trading, as evidenced by a large increase in option trading activity, can be recognized. Typically, the majority of the increased volume occurs in the near-term option series, particularly the at-the-money strike and perhaps the next strike out-of-the-money. The activity doesn't cease there, however. It propagates out to other option series as market-makers (who by the nature of their job function are *short* the near-term options that those with insider knowledge are buying) snap up everything on the books that they can find. In addition, the market-makers may try to entice others, perhaps institutions, to sell some expensive calls against a portion of their institutional stock holdings. Activity of this sort should be a warning sign to the volatility seller to stand aside in this situation.

Of course, on any given day there are many stocks whose options are extraordinarily active, but the increase in activity doesn't have anything to do with insider trading. This might include a large covered call write or maybe a large put purchase established by an institution as a hedge against an existing stock position, or a relatively large conversion or reversal arbitrage established by an arbitrageur, or even a large spread transaction initiated by a hedge fund. In any of these cases, option volume would jump dramatically, but it wouldn't mean that anyone had inside knowledge about a forthcoming corporate event. Rather, the increases in option trading volume as described in this paragraph are merely functions of the normal workings of the marketplace.

What distinguishes these arbitrage and hedging activities from the machinations of insider trading is: (1) There is little propagation of option volume into other series in the "benign" case, and (2) the stock price itself may languish. However, when true insider activity is present, the market-makers react to the aggressive nature of the call buying. These market-makers know they need to hedge themselves, because they do not want to be short naked call options in case a takeover bid or some other news spurs the stock dramatically higher. As mentioned earlier, they try to buy up any other options offered in "the book," but there may not be many of those. So, as a last result, the way they reduce their negative position delta is to *buy stock*. Thus, if the options are active and expensive, and if the stock is rising too, you probably have a reasonably good indication that "someone knows something." However, if the options are expensive but none of the other factors are present, especially if the stock is *declining* in price – then one might feel more comfortable with a strategy of selling volatility in this case.

However, there is a case in which options might be the object of pursuit by someone with insider knowledge, yet not be accompanied by heavy trading volume. This situation could occur with illiquid options. In this case, a floor broker holding

the order of those with insider information might come into the pit to buy options, but the market-makers may not sell them many, preferring to raise their offering price rather than sell a large quantity. If this happens a few times in a row, the options will have gotten very expensive as the floor broker raises his bid price repeatedly, but only buys a few contracts each time. Meanwhile, the market-maker keeps raising his offering price.

Eventually, the floor broker concludes that the options are too expensive to bother with and walks away. Perhaps his client then buys stock. In any case, what has happened is that the options have gotten very expensive as the bids and offers were repeatedly raised, but not much option volume was actually traded because of the illiquidity of the contracts. Hence the normal warning light associated with a sudden increase in option volume would not be present. In this case, though, a volatility seller should still be careful, because he does not want to step in to sell calls right before some major corporate news item is released. The clue here is that implied volatility literally *exploded* in a short period of time (one day, or actually less time), and that alone should be enough warning to a volatility seller.

The point that should be taken here is that when options suddenly become very expensive, especially if accompanied by strong stock price movement and strong stock volume, there may very well be a good reason why that is happening. That reason will probably become public knowledge shortly in the form of a news event. In fact, a major market-maker once said he believed that *most* increases in implied volatility were eventually justified – that is, some corporate news item was released that made the stock jump. Hence, a volatility seller should avoid situations such as these. Any sudden increase in implied volatility should probably be viewed as a potential news story in the making. These situations are not what a neutral volatility seller wants to get into.

On the other hand, if options have become expensive *as a result of* corporate news, then the volatility seller can feel more comfortable making a trade. Perhaps the company has announced poor earnings and the stock has taken a beating while implied volatility rose. In this situation, one can assess the information and analyze it clearly; he is not dealing with some hidden facts known to only a few insider traders. With clear analysis, one might be able to develop a volatility selling strategy that is prudent and potentially profitable.

Another situation in which options become expensive in the wake of market action is during a bear market in the underlying. This can be true for indices, stocks, and futures contracts. The Crash of '87 is an extreme example, but implied volatility shot through the roof during the crash. Other similar sharp market collapses – such as October 1989, October 1997, and August–September 1998 – caused implied volatility to jump dramatically. In these situations, the volatility seller knows why

implied volatility is high. Given that fact, he can then construct positions around a neutral strategy or around his view of the future. The time when the volatility seller must be careful is when the options are expensive and no one seems to know why. That's when insider trading may be present, and that's when the volatility seller should defer from selling options.

CHEAP OPTIONS

When options are cheap, there are usually far less discernible reasons why they have become cheap. An obvious one may be that the corporate structure of the company has changed; perhaps it is being taken over, or perhaps the company has acquired another company nearly its size. In either case, it is possible that the combined entity's stock will be less volatile than the original company's stock was. As the takeover is in the process of being consummated, the implied volatility of the company's options will drop, giving the false impression that they are cheap.

In a similar vein, a company may mature, perhaps issuing more shares of stock, or perhaps building such a good earnings stream that the stock is considered less volatile than it formerly was. Some of the Internet companies will be classic cases: In the beginning they were high-flying stocks with plenty of price movement, so the options traded with a relatively high degree of implied volatility. However, as the company matures, it buys other Internet companies and then perhaps even merges with a large, established company (America Online and Time-Warner Communications, for example). In these cases, actual (statistical) volatility will diminish as the company matures, and implied volatility will do the same. On the surface, a buyer of volatility may see the reduced volatility as an attractive buying situation, but upon further inspection he may find that it is justified. If the decrease in implied volatility seems justified, a buyer of volatility should ignore it and look for other opportunities.

All volatility traders should be suspicious when volatility seems to be extreme – either too expensive or too cheap. The trader should investigate the possibilities as to *why* volatility is trading at such extreme levels. In some cases, the supply and demand of the public just pushes the options to extreme levels; there is nothing more involved than that. Those are the best volatility trading situations. However, if there is a hint that the volatility has gotten to an extreme reading because of some logical (but perhaps nonpublic) reason, then the volatility trader should be suspicious and should probably avoid the trade. Typically this happens with expensive options.

Buyers of volatility really have little to fear if they miscalculate and thus buy an option that appears inexpensive but turns out not to be, in reality. The volatility buyer might lose money if he does this, and overpaying for options constantly will lead to ruin, but an occasional mistake will probably not be fatal.

Sellers of volatility, however, have to be a lot more careful. One mistake could be the last one. Selling naked calls that seem terrifically expensive by historic standards could be ruinous if a takeover bid subsequently emerges at a large premium to the stock's current price. Even put sellers must be careful, although a lot of traders think that selling naked puts is safe because it's the same as buying stock. But who ever said buying stock wasn't risky? If the stock literally collapses – falling from 80, say, to 15 or 20, as Oxford Health did, or from 30 to 2 as Sunrise Technology did – then a put seller will be buried. Since the risk of loss from naked option selling is large, one could be wiped out by a huge gap opening. That's why it's imperative to study *why* the options are expensive before one sells them. If it's known, for example, that a small biotech company is awaiting FDA trial results in two weeks, and all the options suddenly become expensive, the volatility seller should *not* attempt to be a hero. It's obvious that at least some traders believe that there is a chance for the stock to gap in price dramatically. It would be better to find some other situation in which to sell options.

The seller of futures options or index options should be cautious too, although there can't be takeovers in those markets, nor can there be a huge earnings surprise or other corporate event that causes a big gap. The futures markets, though do have things like crop reports and government economic data to deal with, and those can create volatile situations, too. The bottom line is that volatility selling – even *hedged* volatility selling – can be taxing and aggravating if one has sold volatility in front of what turns out to be a news item that justifies the expensive volatility.

SUMMARY

Volatility trading is a predictable way to approach the market, because volatility almost invariably trades in a range and therefore its value can be estimated with a great deal more precision than can the actual prices of the underlyings. Even so, one must be careful in his approach to volatility trading, because diligent research is needed to determine if, in fact, volatility is "cheap" or "expensive." As with any systematic approach to the market, if one is sloppy about his research, he cannot expect to achieve superior results. In the next few chapters, a good deal of time will be spent to give the reader a good understanding of how volatility affects positions and how it can be used to construct trades with positive expected rates of return.

CHAPTER 37

How Volatility Affects Popular Strategies

The previous chapter addressed the calculation or interpretation of implied volatility, and how to relate it to historic volatility. Another, related topic that is important is how implied volatility affects a specific option strategy. Simplistically, one might think that the effect of a change in implied volatility on an option position would be a simple matter to discern; but in reality, most traders don't have a complete grasp of the ways that volatility affects option positions. In some cases, especially option spreads or more complex positions, one may not have an intuitive "picture" of how his position is going to be affected by a change in implied volatility. In this chapter, we'll attempt a relatively thorough review of how implied volatility changes affect most of the popular option strategies.

There are ways to use computer analysis to "draw" a picture of this volatility effect, of course, and that will be discussed momentarily. But an option strategist should have some idea of the general changes that a position will undergo if implied volatility changes. Before getting into the individual strategies, it is important that one understands some of the basics of the effect of volatility on an option's price.

VEGA

Technically speaking, the term that one uses to quantify the impact of volatility changes on the price of an option is called the *vega* of the option. In this chapter, the references will be to vega, but the emphasis here is on practicality, so the descriptions

of how volatility affects option positions will be in plain English as well as in the more mathematical realm of vega. Having said that, let's define vega so that it is understood for later use in the chapter.

Simply stated, vega is the amount by which an option's price changes when volatility changes by one percentage point.

Example: XYZ is selling at 50, and the July 50 call is trading at 7.25. Assume that there is no dividend, that short-term interest rates are 5%, and that July expiration is exactly three months away. With this information, one can determine that the implied volatility of the July 50 call is 70%. That's a fairly high number, so one can surmise that XYZ is a volatile stock. What would the option price be if implied volatility were rise to 71%? Using a model, one can determine that the July 50 call would theoretically be worth 7.35 if that happened. Hence, the vega of this option is 0.10 (to two decimal places). That is, the option price increased by 10 cents, from 7.25 to 7.35, when volatility rose by one percentage point. (Note that "percentage point" here means a full point increase in volatility, from 70% to 71%.)

What if implied volatility had *decreased* instead? Once again, one can use the model to determine the change in the option price. In this case, using an implied volatility of 69% and keeping everything else the same, the option would then theoretically be worth 7.15 – again, a 0.10 change in price (this time, a decrease in price).

This example points out an interesting and important aspect of how volatility affects a call option: *If implied volatility increases, the price of the option will increase, and if implied volatility decreases, the price of the option will decrease.* Thus, there is a *direct* relationship between an option's price and its implied volatility.

Mathematically speaking, vega is the partial derivative of the Black–Scholes model (or whatever model you're using to price options) with respect to volatility. In the above example, the vega of the July 50 call, with XYZ at 50, can be computed to be 0.098 – very near the value of 0.10 that one arrived at by inspection.

Vega also has a direct relationship with the price of a put. That is, as implied volatility rises, the price of a put will rise as well.

Example: Using the same criteria as in the last example, suppose that XYZ is trading at 50, that July is three months away, that short-term interest rates are 5%, and that there is no dividend. In that case, the following theoretical put and call prices would apply at the stated implied volatilities:

Stock Price	July 50 call	July 50 put	Implied Volatility	Put's Vega
50	7.15	6.54	69%	0.10
	7.25	6.64	70%	0.10
	7.35	6.74	71%	0.10

Thus, the put's vega is 0.10, too – the same as the call's vega was.

In fact, it can be stated that a call and a put with the same terms have the same vega. To prove this, one need only refer to the arbitrage equation for a conversion. If the call increases in price and everything else remains equal – interest rates, stock price, and striking price – then the put price must increase by the same amount. A change in implied volatility will cause such a change in the call price, and a similar change in the put price. Hence, the vega of the put and the call must be the same.

It is also important to know how the vega changes as other factors change, particularly as the stock price changes, or as time changes. The following examples contain several tables that illustrate the behavior of vega in a typically fluctuating environment.

Example: In this case, let the stock price fluctuate while holding interest rate (5%), implied volatility (70%), time (3 months), dividends (0), and the strike price (50) constant. See Table 37-1.

In these cases, vega drops when the stock price does, too, but it remains fairly constant if the stock rises. It is interesting to note, though, that in the real world, when the underlying drops in price – especially if it does so quickly, in a panic mode – implied volatility can increase dramatically. Such an increase may be of great benefit to a call holder, serving to mitigate his losses, perhaps. This concept will be discussed further later in this chapter.

TABLE 37-1

Stock Price	Implied Volatility July 50 Call Price	Theoretical Call Price	Vega
30	70%	0.47	0.028
40		2.62	0.073
50		7.25	0.098
60		14.07	0.092
70		22.35	0.091

The above example assumed that the stock was making instantaneous changes in price. In reality, of course, time would be passing as well, and that affects the vega too. Table 37-2 shows how the vega changes when time changes, all other factors being equal.

Example: In this example, the following items are held fixed: stock price (50), strike price (50), implied volatility (70%), risk-free interest rate (5%), and dividend (0). But now, *we let time fluctuate.*

Table 37-2 clearly shows that the passage of time results not only in a decreasing call price, but in a decreasing vega as well. This makes sense, of course, since one cannot expect an increase in implied volatility to have much of an effect on a very short-term option – certainly not to the extent that it would affect a LEAPS option.

Some readers might be wondering how changes in implied volatility itself would affect the vega. This might be called the "vega of the vega," although I've never actually heard it referred to in that manner. The next table explores that concept.

Example: Again, some factors will be kept constant – the stock price (50), the time to July expiration (3 months), the risk-free interest rate (5%), and the dividend (0). Table 37-3 allows implied volatility to fluctuate and shows what the theoretical price of a July 50 call would be, as well as its vega, at those volatilities.

Thus, Table 37-3 shows that vega is surprisingly constant over a wide range of implied volatilities. That's the real reason why no one bothers with "vega of the vega." Vega begins to decline only if implied volatility gets exceedingly high, and implied volatilities of that magnitude are relatively rare.

One can also compute the distance a stock would need to rise in order to overcome a decrease in volatility. Consider Figure 37-1, which shows the theoretical price

TABLE 37-2

Stock Price	Implied Volatility	Time Remaining	Theoretical Call Price	Vega
50	70%	One year	14.60	0.182
		Six months	10.32	0.135
		Three months	7.25	0.098
		Two months	5.87	0.080
		One month	4.16	0.058
		Two weeks	2.87	0.039
		One week	1.96	0.028
		One day	0.73	0.010

TABLE 37-3

Stock Price	Implied Volatility	Theoretical Call Price	Vega
50	10%	1.34	0.097
	30%	3.31	0.099
	50%	5.28	0.099
	70%	7.25	0.098
	100%	10.16	0.096
	150%	14.90	0.093
	200%	19.41	0.088

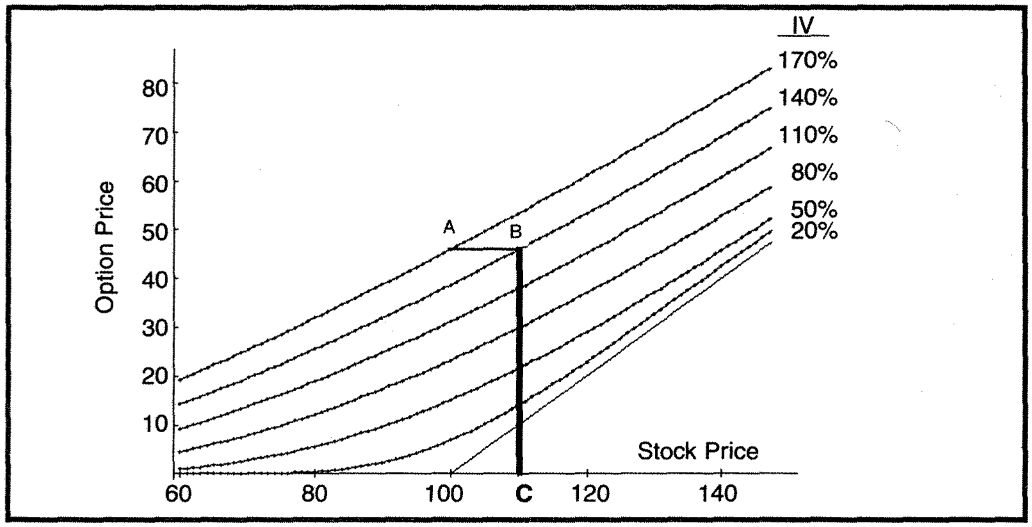
of a 6-month call option with differing implied volatilities. Suppose one buys an option that currently has implied volatility of 170% (the top curve on the graph). Later, investor perceptions of volatility diminish, and the option is trading with an implied volatility of 140%. That means that the option is now "residing" on the *second* curve from the top of the list. Judging from the general distance between those two curves, the option has probably lost between 5 and 8 points of value due to the drop in implied volatility.

Here's another way to think about it. Again, suppose one buys an at-the-money option (stock price = 100) when its implied volatility is 170%. That option value is marked as point A on the graph in Figure 37-1. Later, the option's implied volatility drops to 140%. How much does the stock have to rise in order to overcome the loss of implied volatility? The horizontal line from point A to point B shows that the option value is the same on each line. Then, dropping a vertical line from B down to point C, we see that point C is at a stock price of about 109. Thus, the stock would have to rise 9 points just to keep the option value constant, *if implied volatility drops from 170% to 140%.*

IMPLIED VOLATILITY AND DELTA

Figure 37-1 shows another rather unusual effect: When implied volatility gets very high, the delta of the option doesn't change much. Simplistically, the delta of an option measures how much the option changes in price when the stock moves one point. Mathematically, the delta is the first partial derivative of the option model with respect to stock price. Geometrically, that means that *the delta of an option is the slope of a line drawn tangent to the curve in the preceding chart.*

FIGURE 37-1.
Theoretical option prices at differing implied volatilities (6-month calls).



The bottom line in Figure 37-1 (where implied volatility = 20%) has a distinct curvature to it when the stock price is between about 80 and 120. Thus the delta ranges from a fairly low number (when the stock is near 80) to a rather high number (when the stock is near 120). Now look at the top line on the chart, where implied volatility = 170%. It's almost a straight line from the lower left to the upper right! The slope of a straight line is constant. This tells us that the delta (which is the slope) *barely changes for such an expensive option – whether the stock is trading at 60 or it's trading at 150*! That fact alone is usually surprising to many.

In addition, the value of this delta can be measured: It's 0.70 or higher from a stock price of 80 all the way up to 150. Among other things, this means that an out-of-the-money option that has extremely high implied volatility has a fairly high delta – and can be expected to mirror stock price movements more closely than one might think, were he not privy to the delta.

Figure 37-2 follows through on this concept, showing how the delta of an option varies with implied volatility. From this chart, it is clear how much the delta of an option varies when the implied volatility is 20%, as compared to how little it varies when implied volatility is extremely high.

That data is interesting enough by itself, but it becomes even more thought-provoking when one considers that a change in the implied volatility of his option (vega) also can mean a significant change in the delta of the option. In one sense, it explains why, in the first chart (Figure 37-1), the stock could rise 9 points and yet the option holder made nothing, because implied volatility declined from 170% to 140%.

EFFECTS ON NEUTRALITY

A popular concept that uses delta is the "delta-neutral" spread – a spread whose profitability is supposedly ambivalent to market movement, at least for short time frames and limited stock price changes. Anything that significantly affects the delta of an option can affect this neutrality, thus causing a delta-neutral position to become unbalanced (or, more likely, causing one's intuition to be wrong regarding what constitutes a delta-neutral spread in the first place).

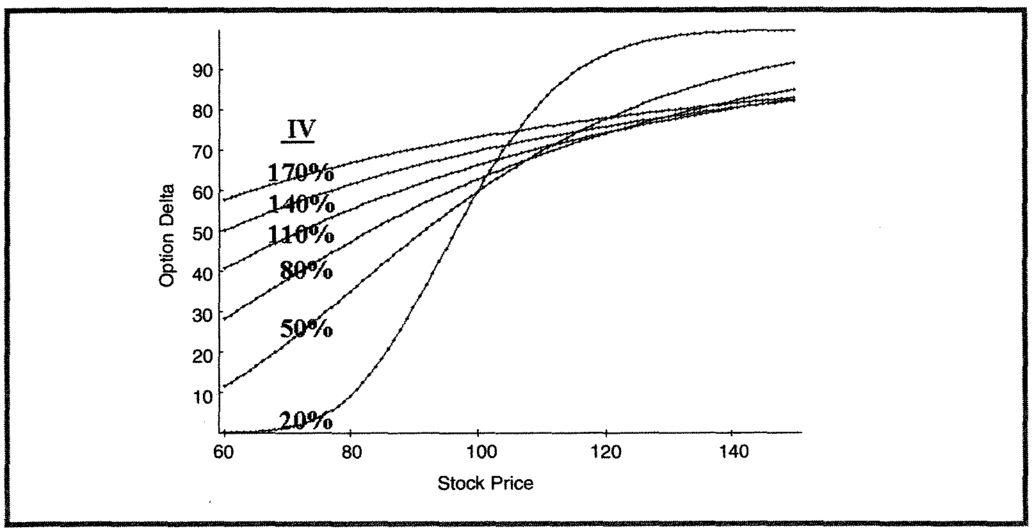
Let's use a familiar strategy, the straddle purchase, as an example. Simplistically, when one buys a straddle, he merely buys a put and a call with the same terms and doesn't get any fancier than that. However, it may be the case that, due to the deltas of the options involved, that approach is biased to the upside, and a neutral straddle position should be established instead.

Example: Suppose that XYZ is trading at 100, that the options have an implied volatility of 40%, and that one is considering buying a six-month straddle with a striking price of 100. The following data summarize the situation, including the option prices and the deltas:

XYZ Common: 100; Implied Volatility: 40%

Option	Price	Delta
XYZ October 100 call	12.00	0.60
XYZ October 100 put	10.00	–0.40

FIGURE 37-2.
Value of delta of a 6-month option at differing implied volatilities.



Notice that the stock price is *equal to* the strike price (100). However, the deltas are not at all equal. In fact, the delta of the call is 1.5 times that of the put (in absolute value). One must buy *three puts and two calls* in order to have a delta-neutral position.

Most experienced option traders know that the delta of an at-the-money call is somewhat higher than that of an at-the-money put. Consequently, they often estimate, without checking, that buying three puts and two calls produces a delta-neutral "straddle buy." However, consider a similar situation, but with a much higher implied volatility – 110%, say.

AAA Common: 100; Implied Volatility: 110%

Option	Price	Delta
AAA October 100 call	31.00	0.67
AAA October 100 put	28.00	–0.33

The delta-neutral ratio here is two-to-one (67 divided by 33), not three-to-two as in the earlier case – even though both stock prices are 100 and both sets of options have six months remaining. This is a big difference in the delta-neutral ratio, especially if one is trading a large quantity of options. This shows how different levels of implied volatility can alter one's perception of what is a neutral position. It also points out that one can't necessarily rely on his intuition; it is always best to check with a model.

Carrying this thought a step further, one must be mindful of a change in implied volatility if he wants to *keep* his position delta-neutral. If the implied volatility of AAA options should drop significantly, the 2-to-1 ratio will no longer be neutral, even if the stock is still trading at 100. Hence, a trader wishing to remain delta-neutral must monitor not only changes in stock price, but changes in implied volatility as well. For more complex strategies, one will also find the delta-neutral ratio changing due to a change in implied volatility.

The preceding examples summarize the major variables that might affect the vega and also show how vega affects things other than itself, such as delta and, therefore, delta neutrality. By the way, the vega of the underlying is zero; an increase in implied volatility does not affect the price of the underlying instrument at all, in theory. In reality, if options get very expensive (i.e., implied volatility spikes up), that usually brings traders into a stock and so the stock price will change. But that's not a mathematical relationship, just a market cause-and-effect relationship.

POSITION VEGA

As can be done with delta or with any other of the partial derivatives of the model, one can compute a *position vega* – the vega of an entire position. The position vega is determined by multiplying the individual option vegas by the quantity of options bought or sold. The "position vega" is merely the quantity of options held, times the vega, times the shares per options (which is normally 100).

Example: Using a simple call spread as an example, assume the following prices exist:

Security	Position	Vega	Position Vega
XYZ Stock	No position		
XYZ July 50 call	Long 3 calls	0.098	+0.294
XYZ July 70 call	Short 5 calls	0.076	–0.380
Net Position Vega:			**–0.086**

This concept is very important to a volatility trader, for it tells him if he has constructed a position that is going to behave in the manner he expects. For example, suppose that one identifies expensive options, and he figures that implied volatility will decrease, eventually becoming more in line with its historical norms. Then he would want to construct a position with a *negative position vega.* A negative position vega indicates that the position will profit if implied volatility *decreases.* Conversely, a buyer of volatility – one who identifies some underpriced situation – would want to construct a position with a *positive position vega,* for such a position will profit if implied volatility *rises.* In either case, other factors such as delta, time to expiration, and so forth will have an effect on the position's actual dollar profit, but the concept of position vega is still important to a volatility trader. It does no good to identify cheap options, for example, and then establish some strange spread with a negative position vega. Such a construct would be at odds with one's intended purpose – in this case, buying cheap options.

OUTRIGHT OPTION PURCHASES AND SALES

Let us now begin to investigate the affects of implied volatility on various strategies, beginning with the simplest strategy of all – the outright option purchase. It was already shown that implied volatility affects the price of an individual call or put in a

direct manner. That is, an increase in implied volatility will cause the option price to rise, while a decrease in volatility will cause a decline in the option price. That piece of information is the most important one of all, for it imparts what an option trader needs to know: An explosion in implied volatility is a boon to an option owner, but can be a devastating detriment to an option seller, especially a naked option seller.

A couple of examples might demonstrate more clearly just how powerful the effect of implied volatility is, even when there isn't much time remaining in the life of an option. One should understand the notion that an increase in implied volatility can overcome days, even weeks, of time decay. This first example attempts to quantify that statement somewhat.

Example: Suppose that XYZ is trading at 100 and one is interested in analyzing a 3-month call with striking price of 100. Furthermore, suppose that implied volatility is currently at 20%. Given these assumptions, the Black–Scholes model tells us that the call would be trading at a price of 4.64.

Stock Price:	100
Strike Price:	100
Time Remaining:	3 months
Implied Volatility:	20%
Theoretical Call Value:	4.64

Now, suppose that a month passes. If implied volatility remained the same (20%), the call would lose nearly a point of value due to time decay. However, how much would implied volatility have had to increase to completely counteract the effect of that time decay? That is, after a month has passed, what implied volatility will yield a call price of 4.64? It turns out to be just under 26%.

Stock Price:	100
Strike Price:	100
Time Remaining:	2 months
Implied Volatility:	25.9%
Theoretical Call Value:	4.64

What would happen after *another* month passes? There is, of course, some implied volatility at which the call would still be worth 4.64, but is it so high as to be unreasonable? Actually, it turns out that if implied volatility increases to about 38%, the call will still be worth 4.64, even with only one month of life remaining:

Stock Price:	100
Strike Price:	100
Time Remaining:	1 month
Implied Volatility:	38.1%
Theoretical Call Value:	4.64

So, if implied volatility increases from 20% to 26% over the first month, then this call option would still be trading at the same price – 4.64. That's not an unusual increase in implied volatility; increases of that magnitude, 20% to 26%, happen all the time. For it to then increase from 26% to 38% over the *next* month is probably less likely, but it is certainly not out of the question. There have been many times in the past when just such an increase has been possible – during any of the August, September, or October bear markets or mini-crashes, for example. Also, such an increase in implied volatility might occur if there were takeover rumors in this stock, or if the entire market became more volatile, as was the case in the latter half of the 1990s.

Perhaps this example was distorted by the fact that an implied volatility of 20% is a fairly low number to begin with. What would a similar example look like if one started out with a much higher implied volatility – say, 80%?

Example: Making the same assumptions as in the previous example, but now setting the implied volatility to a much higher level of 80%, the Black–Scholes model now says that the call would be worth a price of 16.45:

Stock Price:	100
Strike Price:	100
Time Remaining:	3 months
Implied Volatility:	80%
Theoretical Call Value:	16.45

Again, one must ask the question: "If a month passes, what implied volatility would be necessary for the Black–Scholes model to yield a price of 16.45?" In this case, it turns out to be an implied volatility of just over 99%.

Stock Price:	100
Strike Price:	100
Time Remaining:	2 months
Implied Volatility:	99.4%
Theoretical Call Value:	16.45

direct manner. That is, an increase in implied volatility will cause the option price to rise, while a decrease in volatility will cause a decline in the option price. That piece of information is the most important one of all, for it imparts what an option trader needs to know: An explosion in implied volatility is a boon to an option owner, but can be a devastating detriment to an option seller, especially a naked option seller.

A couple of examples might demonstrate more clearly just how powerful the effect of implied volatility is, even when there isn't much time remaining in the life of an option. One should understand the notion that an increase in implied volatility can overcome days, even weeks, of time decay. This first example attempts to quantify that statement somewhat.

Example: Suppose that XYZ is trading at 100 and one is interested in analyzing a 3-month call with striking price of 100. Furthermore, suppose that implied volatility is currently at 20%. Given these assumptions, the Black–Scholes model tells us that the call would be trading at a price of 4.64.

Stock Price:	100
Strike Price:	100
Time Remaining:	3 months
Implied Volatility:	20%
Theoretical Call Value:	4.64

Now, suppose that a month passes. If implied volatility remained the same (20%), the call would lose nearly a point of value due to time decay. However, how much would implied volatility have had to increase to completely counteract the effect of that time decay? That is, after a month has passed, what implied volatility will yield a call price of 4.64? It turns out to be just under 26%.

Stock Price:	100
Strike Price:	100
Time Remaining:	2 months
Implied Volatility:	25.9%
Theoretical Call Value:	4.64

What would happen after *another* month passes? There is, of course, some implied volatility at which the call would still be worth 4.64, but is it so high as to be unreasonable? Actually, it turns out that if implied volatility increases to about 38%, the call will still be worth 4.64, even with only one month of life remaining:

Stock Price:	100
Strike Price:	100
Time Remaining:	1 month
Implied Volatility:	38.1%
Theoretical Call Value:	4.64

So, if implied volatility increases from 20% to 26% over the first month, then this call option would still be trading at the same price – 4.64. That's not an unusual increase in implied volatility; increases of that magnitude, 20% to 26%, happen all the time. For it to then increase from 26% to 38% over the *next* month is probably less likely, but it is certainly not out of the question. There have been many times in the past when just such an increase has been possible – during any of the August, September, or October bear markets or mini-crashes, for example. Also, such an increase in implied volatility might occur if there were takeover rumors in this stock, or if the entire market became more volatile, as was the case in the latter half of the 1990s.

Perhaps this example was distorted by the fact that an implied volatility of 20% is a fairly low number to begin with. What would a similar example look like if one started out with a much higher implied volatility – say, 80%?

Example: Making the same assumptions as in the previous example, but now setting the implied volatility to a much higher level of 80%, the Black–Scholes model now says that the call would be worth a price of 16.45:

Stock Price:	100
Strike Price:	100
Time Remaining:	3 months
Implied Volatility:	80%
Theoretical Call Value:	16.45

Again, one must ask the question: "If a month passes, what implied volatility would be necessary for the Black–Scholes model to yield a price of 16.45?" In this case, it turns out to be an implied volatility of just over 99%.

Stock Price:	100
Strike Price:	100
Time Remaining:	2 months
Implied Volatility:	99.4%
Theoretical Call Value:	16.45

Finally, to be able to completely compare this example with the previous one, it is necessary to see what implied volatility would have to rise to in order to offset the effect of yet another month's time decay. It turns out to be over 140%:

Stock Price:	100
Strike Price:	100
Time Remaining:	1 month
Implied Volatility:	140.9%
Theoretical Call Value:	16.45

Table 37-4 summarizes the results of these examples, showing the levels to which implied volatility would have to rise to maintain the call's value as time passes.

Are the volatility increases in the latter example less likely to occur than the ones in the former example? Probably yes – certainly the last one, in which implied volatility would have to increase from 80% to nearly 141% in order to maintain the call's value. However, in another sense, it may seem more reasonable: Note that the increase in volatility from 20% to 26% is a 30% increase. That is, 20% times 1.30 equals 26%. That's what's required to maintain the call's value for the lower volatility over the first month – an increase in the magnitude of implied volatility of 30%. At the *higher* volatility, though, an increase in magnitude of only about 25% is required (from 80% to 99%). Thus, in *those* terms, the two appear on more equal footing.

What makes the top line of Table 37-4 *appear* more likely than the bottom line is merely the fact that an experienced option trader knows that many stocks have implied volatilities that can fluctuate in the 20% to 40% range quite easily. However, there are far fewer stocks that have implied volatilities in the higher range. In fact, until the Internet stocks got hot in the latter portion of the 1990s, the only ones with volatilities like those were very low-priced, extremely volatile stocks. Hence one's experience factor is lower with such high implied volatility stocks, but it doesn't mean that the volatility fluctuations appearing in Table 37-4 are impossible.

If the reader has access to a software program containing the Black–Scholes model, he can experiment with other situations to see how powerful the effect of implied volatility is. For example, without going into as much detail, if one takes the case of a 12-month option whose initial implied volatility is 20%, all it takes to main-

TABLE 37-4

Initial Implied Volatility	Volatility Leveled Required to Maintain Call Value … …After One Month	…After Two Months
20%	26%	38%
80%	99%	141%

tain the call's value over a 6-month time period is an increase in implied volatility to 27%. Taken from the viewpoint of the option seller, this is perhaps most enlightening: If you sell a one-year (LEAPS) option and six months pass, during which time implied volatility increases from 20% to 27% – certainly quite possible – you will have made nothing! The call will still be selling for the same price, assuming the stock is still selling for the same price.

Finally, it was mentioned earlier that implied volatility often explodes during a market crash. In fact, one could determine just how much of an increase in implied volatility would be necessary in a market crash in order to maintain the call's value. This is similar to the first example in this section, but now the stock price will be allowed to decrease as well. Table 37-5, then, shows what implied volatility would be required to maintain the call's initial value (a price of 4.64), when the stock price falls. The other factors remain the same: time remaining (3 months), striking price (100), and interest rate (5%). Again, this table shows instantaneous price changes. In real life, a slightly higher implied volatility would be necessary, because each market crash could take a day or two.

Thus, from Table 37-5, one could say that even if the underlying stock dropped 20 points (which is 20% in this case) in one day, yet implied volatility exploded from 20% to 67% at the same time, the call's value would be unchanged! Could such an outrageous thing happen? It *has*: In the Crash of '87, the market plummeted 22% in one day, while the Volatility Index ($VIX) theoretically rose from 36% to 150% in one day. In fact, call buyers of some $OEX options actually broke even or made a little money due to the explosion in implied volatility, despite the fact that the worst market crash in history had occurred.

If nothing else, these examples should impart to the reader how important it is to be aware of implied volatility at the time an option position is established. If you are buying options, and you buy them when implied volatility is "low," you stand to

TABLE 37-5

Stock Price	Implied Volatility Necessary for Call to Maintain Value
100	20% (the initial parameters)
95	33%
90	44%
85	55%
80	67%
75	78%
70	89%

benefit if implied volatility merely returns to "normal" levels while you hold the position. Of course, having the underlying increase in price is also important.

Conversely, an option seller should be keenly aware of implied volatility when the option is initially sold – perhaps even more so than the buyer of an option. This pertains equally well to naked option writers and to covered option writers. If implied volatility is "too low" when the option writing position is established, then an increase (or worse, an explosion) in implied volatility will be very detrimental to the position, completely overcoming the effects of time decay. Hence, an option writer should not just sell options because he thinks he is collecting time decay each day that passes. That may be true, but an increase in implied volatility can completely dominate what little time decay might exist, especially for a longer-term option.

In a similar manner, a *decrease* in implied volatility can be just as important. Thus, if the call buyer purchases options that are "too costly," ones in which implied volatility is "too high," then he could lose money even if the underlying makes a modest move in his favor.

In the next chapters, the topic of just how an option buyer or seller should measure implied volatility to determine what is "too low" or "too high" will be discussed. For now, suffice it to grasp the general concept that a change in implied volatility can have substantial effects on an option's price – far greater effects than the passage of time can have.

In fact, all of this calls into question just exactly what *time value premium* is. That part of an option's value that is *not* intrinsic value is really affected much more by volatility than it is by time decay, yet it carries the term "time value premium."

TIME VALUE PREMIUM IS A MISNOMER

Many (perhaps novice) option traders seem to think of *time* as the main antagonist to an option buyer. However, when one really thinks about it, he should realize that the portion of an option that is *not* intrinsic value is really much more related to stock price movement and/or volatility than anything else, at least in the short term. For this reason, it might be beneficial to more closely analyze just what the "excess value" portion of an option represents and why a buyer should not primarily think of it as time value premium.

An option's price is composed of two parts: (1) intrinsic value, which is the "real" part of the option's value – the distance by which the option is in-the-money, and (2) "excess value" – often called time value premium. There are actually five factors that affect the "excess value" portion of an option. Eventually, time will dominate them

all, but the longer the life of the option, the more the other factors influence the "excess value."

The five factors influencing excess value are:

1. stock price movements,
2. changes in implied volatility,
3. the passage of time,
4. changes in the dividend (if any exist), and
5. changes in interest rates.

Each is stated in terms of a movement or change; that is, these are not static things. In fact, to measure them one uses the "greeks": delta, vega, theta, (there is no "greek" for dividend change), and rho. Typically, the effect of a change in dividend or a change in interest rate is small (although a large dividend change or an interest rate change on a very long-term option can produce visible changes in the prices of options).

If everything remains static, then time decay will eventually wipe out all of the excess value of an option. That's why it's called time value premium. But things don't ever remain static, and on a daily basis, time decay is small, so it is the remaining two factors that are most important.

Example: XYZ is trading at 82 in late November. The January 80 call is trading at 8. Thus, the intrinsic value is 2 (82 minus 80) and the excess value is 6 (8 minus 2). If the stock is still at 82 at January expiration, the option will of course only be worth 2, and one will say that the 6 points of excess value that was lost was due to time decay. But on that day in late November, the other factors are much more dominant.

On this particular day, the implied volatility of this option is just over 50%. One can determine that the call's greeks are:

Delta: 0.60
Vega: 0.13
Theta: –0.06

This means, for example, that time decay is only 6 cents per day. It would increase as time went by, but even with a day or so to go, theta would not increase above about 20 cents unless volatility increased or the stock moved closer to the strike price.

From the above figures, one can see – and this should be intuitively appealing – that the biggest factor influencing the price of the option is stock price movement (delta).

It's a little unfair to say that, because it's conceivable (although unlikely) that volatility could jump by a large enough margin to become a greater factor than delta for one day's move in the option. Furthermore, since this option is composed mostly of excess value, these more dominant forces influence the excess value more than time decay does.

There is a direct relationship between vega and excess value. That is, if implied volatility increases, the excess value portion of the option will increase and, if implied volatility decreases, so will excess value.

The relationship between delta and excess value is not so straightforward. The farther the stock moves away from the strike, the more this will have the effect of shrinking the excess value. If the call is in-the-money (as in the above example), then an *increase* in stock price will result in a *decrease* of excess value. That is, a deeply in-the-money option is composed primarily of intrinsic value, while excess value is quite small. However, when the call is out-of-the-money, the effect is just the opposite: Then, an increase in call price will result in an increase in excess value, because the stock price increase is bringing the stock closer to the option's striking price.

For some readers, the following may help to conceptualize this concept. The part of the delta that addresses excess value is this:

Out-of-the-money call: 100% of the delta affects the excess value.

In-the-money call: "1.00 minus delta" affects the excess value. (So, if a call is very deeply in-the-money and has a delta of 0.95, then the delta only has 1.00 – 0.95, or 0.05, room to increase. Hence it has little effect on what small amount of excess value remains in this deeply in-the-money call.)

These relationships are not static, of course. Suppose, for example, that in the same situation of the stock trading at 82 and the January 80 call trading at 8, *there is only week remaining until expiration*! Then the implied volatility would be 155% (high, but not unheard of in volatile times). The greeks would bear a significantly different relationship to each other in this case, though:

Delta: 0.59
Vega: 0.044
Theta: –0.51

This very short-term option has about the same delta as its counterpart in the previous example (the delta of an at-the-money option is generally slightly above 0.50). Meanwhile, vega has shrunk. The effect of a change in volatility on such a short-term option is actually about a third of what it was in the previous example. However, time decay in this example is huge, amounting to half a point per day in this option.

So now one has the idea of how the excess value is affected by the "big three" of stock price movement, change in implied volatility, and passage of time. How can one use this to his advantage? First of all, one can see that an option's excess value may be due much more to the potential volatility of the underlying stock, and therefore to the option's implied volatility, than to time.

As a result of the above information regarding excess value, one shouldn't think that he can easily go around selling what appear to be options with a lot of excess value and then expect time to bring in the profits for him. In fact, there may be a lot of volatility – both actual and implied – keeping that excess value nearly intact for a fairly long period of time. In fact, in the coming chapters on volatility estimation, it will be shown that option buyers have a much better chance of success than conventional wisdom has maintained.

VOLATILITY AND THE PUT OPTION

While it is obvious that an increase in implied volatility will increase the price of a put option, much as was shown for a call option in the preceding discussion, there are certain differences between a put and a call, so a little review of the put option itself may be useful. A put option tends to lose its premium fairly quickly as it becomes an in-the-money option. This is due to the realities of conversion arbitrage. In a conversion arbitrage, an arbitrageur or market-maker buys stock *and* buys the put, while selling the call. If he carries the position to expiration, he will have to pay carrying costs on the debit incurred to establish the position. Furthermore, he would earn any dividends that might be paid while he holds the position. This information was presented in a slightly different form in the chapter on arbitrage, but it is recounted here:

In a perfect world, all option prices would be so accurate that there would be no profit available from a conversion. That is, the following equation (1) would apply:

(1) Call price + Strike price – Stock price – Put price + Dividend – Carrying cost = 0

where carrying cost = strike price / $(1 + r)^t$
t = time to expiration
r = interest rate

Now, it is also known that the time value premium of a put is the amount by which its value exceeds intrinsic value. The intrinsic value of an in-the-money put option is merely the difference between the strike price and the stock price. Hence, one can write the following equation (2) for the time value premium (TVP) of an in-the-money put option:

(2) Put TVP = Put price – Strike price + Stock price

The arbitrage equation, (1), can be rewritten as:

(3) Put price – Strike price + Stock price = Call price + Dividends – Carrying cost

and substituting equation (2) for the terms in equation (3), one arrives at:

(4) Put TVP = Call price + Dividends – Carrying cost

In other words, the time value premium of an in-the-money put is the same as the (out-of-the-money) call price, plus any dividends to be earned until expiration, less any carrying costs over that same time period.

Assuming that the dividend is small or zero (as it is for most stocks), one can see that an in-the-money put would lose its time value premium whenever carrying costs exceed the value of the out-of-the-money call. Since these carrying costs can be relatively large (the carrying cost is the interest being paid on the entire debit of the position – and that debit is approximately equal to the strike price), they can quickly dominate the price of an out-of-the-money call. Hence, the time value premium of an in-the-money put disappears rather quickly.

This is important information for put option buyers, because they must understand that a put won't appreciate in value as much as one might expect, even when the stock drops, since the put loses its time value premium quickly. It's even more important information for put *sellers:* A short put is at risk of assignment as soon as there is no time value premium left in the put. Thus, a put can be assigned well in advance of expiration – even a LEAPS put!

Now, returning to the main topic of how implied volatility affects a position, one can ask himself how an increase or decrease in implied volatility would affect equation (4) above. If implied volatility increases, the call price would increase, and if the increase were great enough, might impart some time value premium to the put. *Hence, an increase in implied volatility also may increase the price of a put, but if the put is too far in-the-money, a modest increase in implied volatility still won't budge the put.* That is, an increase in implied volatility would increase the value of the call, but until it increases enough to be greater than the carrying costs, an in-the-money put will remain at parity, and thus a short put would still remain at risk of assignment.

STRADDLE OR STRANGLE BUYING AND SELLING

Since owning a straddle involves owning both a put and a call with the same terms, it is fairly evident that an increase in implied volatility will be very beneficial for a straddle buyer. A sort of double benefit occurs if implied volatility rises, for it will

positively affect both the put and the call in a long straddle. Thus, if a straddle buyer is careful to buy straddles in situations in which implied volatility is "low," he can make money in one of two ways. Either (1) the underlying price makes a move great enough in magnitude to exceed the initial cost of the straddle, or (2) implied volatility increases quickly enough to overcome the deleterious effects of time decay.

Conversely, a straddle seller risks just the opposite – potentially devastating losses if implied volatility should increase dramatically. However, the straddle seller can register gains faster than just the rate of time decay would indicate if implied volatility *decreases*. Thus, it is very important when selling options – and this applies to covered options as well as to naked ones – to sell only when implied volatility is "high."

A strangle is the same as a straddle, except that the call and put have different striking prices. Typically, the call strike price is higher than the put strike price. Naked option sellers often prefer selling strangles in which the options are well out-of-the-money, so that there is less chance of them having any intrinsic value when they expire. Strangles behave much like straddles do with respect to changes in implied volatility.

The concepts of straddle ownership will be discussed in much more detail in the following chapters. Moreover, the general concept of option buying versus option selling will receive a great deal of attention.

CALL BULL SPREADS

In this section, the bull spread strategy will be examined to see how it is affected by changes in implied volatility. Let's look at a call bull spread and see how implied volatility changes might affect the price of the spread if all else remains equal. Make the following assumptions:

Assumption Set 1:
Stock Price: 100
Time to Expiration: 4 months
Position: Long Call Struck at 90
Short Call Struck at 110

Ask yourself this simple question: If the stock remains unchanged at 100, and implied volatility increases dramatically, will the price of the 90–110 call bull spread grow or shrink? Answer before reading on.

The truth is that, if implied volatility *increases*, the price of the spread will *shrink*. I would suspect that this comes as something of a surprise to a good number of readers. Table 37-6 contains some examples, generated from a Black–Scholes

TABLE 37-6

Stock Price = 100

Implied Volatility	90–110 Call Bull Spread (Theoretical Value)
20%	10.54
30%	9.97
40%	9.54
50%	9.18
60%	8.87
70%	8.58
80%	8.30

model, using the assumptions stated above, the most important of which is that the stock is at 100 in all cases in this table.

One should be aware that it would probably be difficult to actually trade the spread at the theoretical value, due to the bid–asked spread in the options. Nevertheless, the impact of implied volatility is clear.

One can quantify the amount by which an option position will change for each percentage point of increase in implied volatility. Recall that this measure is called the vega of the option or option position. In a call bull spread, one would subtract the vega of the call that is sold from that of the call that is bought in order to arrive at the position vega of the call bull spread. Table 37-7 is a reprint of Table 37-6, but now including the vega.

Since these vegas are all negative, they indicate that the spread will shrink in value if implied volatility rises and that the spread will expand in value if implied

TABLE 37-7

Implied Volatility	90–110 Call Bull Spread (Theoretical Value)	Position Vega
20%	10.54	–0.67
30%	9.97	–0.48
40%	9.54	–0.38
50%	9.18	–0.33
60%	8.87	–0.30
70%	8.58	–0.28
80%	8.30	–0.26

volatility decreases. Again, these statements may seem contrary to what one would expect from a bullish call position.

Of course, it's highly unlikely that implied volatility would change much in the course of just one day while the stock price remained unchanged. So, to get a better handle on what to expect, one really to needs to look at what might happen at some future time (say a couple of weeks hence) at various stock prices. The graph in Figure 37-3 begins the investigation of these more complex scenarios.

The profit curve shown in Figure 37-3 makes certain assumptions: (1) The bull spread assumes the details in Assumption Set 1, above; (2) the spread was bought with an implied volatility of 20% and remained at that level when the profit picture above was drawn; and (3) 30 days have passed since the spread was bought. Under these assumptions, the profit graph shows that the bull spread conforms quite well to what one would expect; that is, the shape of this curve is pretty much like that of a bull spread at expiration, although if you look closely you'll see that it doesn't widen out to nearly its maximum gain or loss potential until the stock is well above 110 or below 90 – the strike prices used in the spread.

Now observe what happens if one keeps all the other assumptions the same, except one. In this case, assume implied volatility was 80% at purchase and remains at 80% one month later. The comparison is shown in Figure 37-4. The 80% curve is overlaid on top of the 20% curve shown earlier. The contrast is quite startling. Instead of looking like a bull spread, the profit curve that uses 80% implied volatili-

FIGURE 37-3.
Bull spread profit picture in 30 days, at 20% IV.

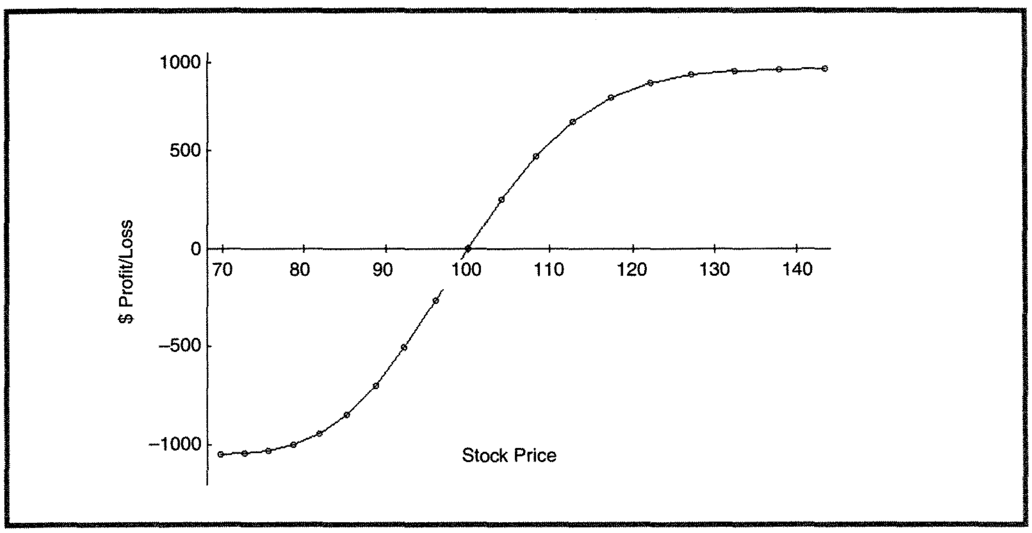
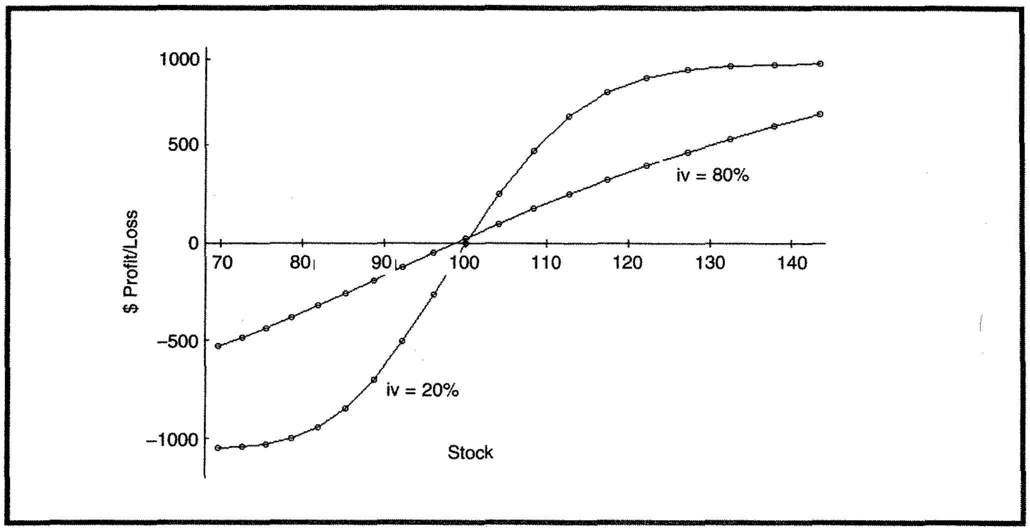


FIGURE 37-4.
Bull spread profit picture in 30 days.



ty is a rather flat thing, sloping only slightly upward – and exhibiting far less risk and reward potential than its lower implied volatility counterpart. This points out another important fact: *For volatile stocks, one cannot expect a 4-month bull spread to expand* **or** *contract much during the first month of life, even if the stock makes a substantial move.* Longer-term spreads have even less movement.

As a corollary, note that if implied volatility *shrinks* while the stock rises, the profit outlook will improve. Graphically, using Figure 37-4, if one's profit picture moves from the 80% curve to the 20% curve on the right-hand side of the chart, that is a positive development. Of course, if the stock drops and the implied volatility drops too, then one's losses would be worse – witness the left-hand side of the graph in Figure 37-4.

A graph could be drawn that would incorporate other implied volatilities, but that would be overkill. The profit graphs of the other spreads from Tables 37-6 or 37-7 would lie between the two curves shown in Figure 37-4.

If this discussion had looked at bull spreads as *put credit* spreads instead of call debit spreads, perhaps these conclusions would not have seemed so unusual. Experienced option traders already understand much of what has been shown here, but less experienced traders may find this information to be different from what they expected.

Some general facts can be drawn about the bull spread strategy. Perhaps the most important one is that, if used on a volatile stock, you won't get much expansion in the spread even if the stock makes a nice move upward in your favor. In fact, for

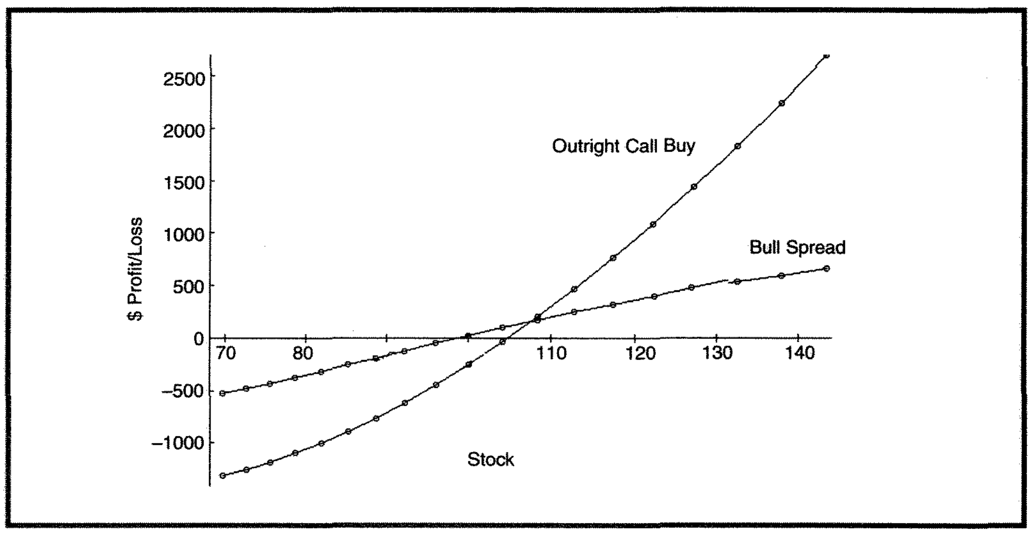
high implied volatility situations, the bull spread won't expand out to its maximum price until expiration draws nigh. That can be frustrating and disappointing.

Often, the bull spread is established because the option trader feels the options are "too expensive" and thus the spread strategy is a way to cut down on the total debit invested. However, the ultimate penalty paid is great. Consider the fact that, if the stock rose from 100 to 130 in 30 days, *any* reasonable four-month call purchase (i.e., with a strike initially near the current stock price) would make a nice profit, while the bull spread barely ekes out a 5-point gain. To wit, the graph in Figure 37-5 compares the purchase of the at-the-money call with a striking price of 100 and the 90–110 call bull spread, both having implied volatility of 80%. Quite clearly, the call purchase dominates to a great extent on an upward move. Of course, the call purchase does worse on the downside, but since these are bullish strategies, one would have to assume that the trader had a positive outlook for the stock when the position was established. Hence, what happens on the downside is not primary in his thinking.

The bull spread and the call purchase have opposite position vegas, too. That is, a rise in implied volatility will help the call purchase but will harm the bull spread (and vice versa). *Thus, the call purchase and the bull spread are not very similar positions at all.*

If one wants to use the bull spread to effectively reduce the cost of buying an expensive at-the-money option, then at least make sure the striking prices are quite

FIGURE 37-5.
Call buy versus bull spread in 30 days; IV = 80%.



wide apart. That will allow for a reasonable amount of price appreciation in the bull spread if the underlying rises in price. Also, one might want to consider establishing the bull spread with striking prices that are *both* out-of-the-money. Then, if the stock rallies strongly, a greater percentage gain can be had by the spreader. Still, though, the facts described above cannot be overcome; they can only possibly be mitigated by such actions.

A FAMILIAR SCENARIO?

Often, one may be deluded into thinking that the two positions are more similar than they are. For example, one does some sort of analysis – it does not matter if it's fundamental or technical – and comes to a conclusion that the stock (or futures contract or index) is ready for a bullish move. Furthermore, he wants to use options to implement his strategy. But, upon inspecting the actual market prices, he finds that the options seem rather expensive. So, he thinks, "Why not use a bull spread instead? It costs less and it's bullish, too."

Fairly quickly, the underlying moves higher – a good prediction by the trader, and a timely one as well. If the move is a violent one, especially in the futures market, implied volatility might increase as well. If you had bought calls, you'd be a happy camper. But if you bought the bull spread, you are not only highly disappointed, but you are now facing the prospect of having to hold the spread for several more weeks (perhaps months) before your spread widens out to anything even approaching the maximum profit potential.

Sound familiar? Every option trader has probably done himself in with this line of thinking at one time or another. At least, now you know the reason why: High or increasing implied volatility is not a friend of the bull spread, while it is a friendly ally of the outright call purchase. Somewhat surprisingly, many option traders don't realize the difference between these two strategies, which they probably consider to be somewhat similar in nature.

So, be careful when using bull spreads. If you really think a call option is too expensive and want to reduce its cost, try this strategy: Buy the call and simultaneously sell a credit put spread (bull spread) using slightly out-of-the-money puts. This strategy reduces the call's net cost and maintains upside potential (although it increases downside risk, but at least it is still a fixed risk).

Example: With XYZ at 100, a trader is bullish and wants to buy the July 100 calls, which expire in two months. However, upon inspection, he finds that they are trading at 10 – an implied volatility of 59%. He knows that, historically, the implied volatility of this stock's options range from approximately 40% to 60%, so these are

very expensive options. If he buys them now and implied volatility returns to its median range near 50%, he will suffer from the decrease in implied volatility.

As a possible remedy, he considers selling an out-of-the-money put credit spread at the same time that he buys the calls. The credit from this spread will act as a means of reducing the net cost of the calls. If he's right and the stock goes up, all will be well. However, the introduction of the put spread into the mix has introduced some additional downside risk.

Suppose the following prices exist:

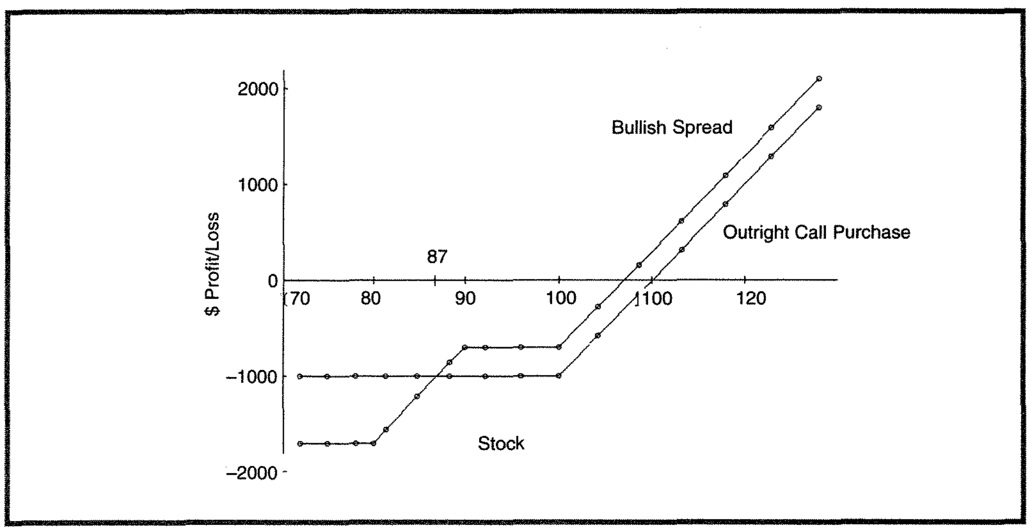
XYZ: 100
July 100 call: 10 (as stated above)
July 90 put: 5
July 80 put: 2

The entire bullish position would now consist of the following:

Buy 1 July 100 call at 10
Buy 1 July 80 put at 2
Sell 1 July 90 put at 5
Net expenditure: 7 point debit (plus commission)

Figure 37-6 shows the profitability, at expiration, of both the outright call purchase and the bullish position constructed above.

FIGURE 37-6.
Profitability at expiration.

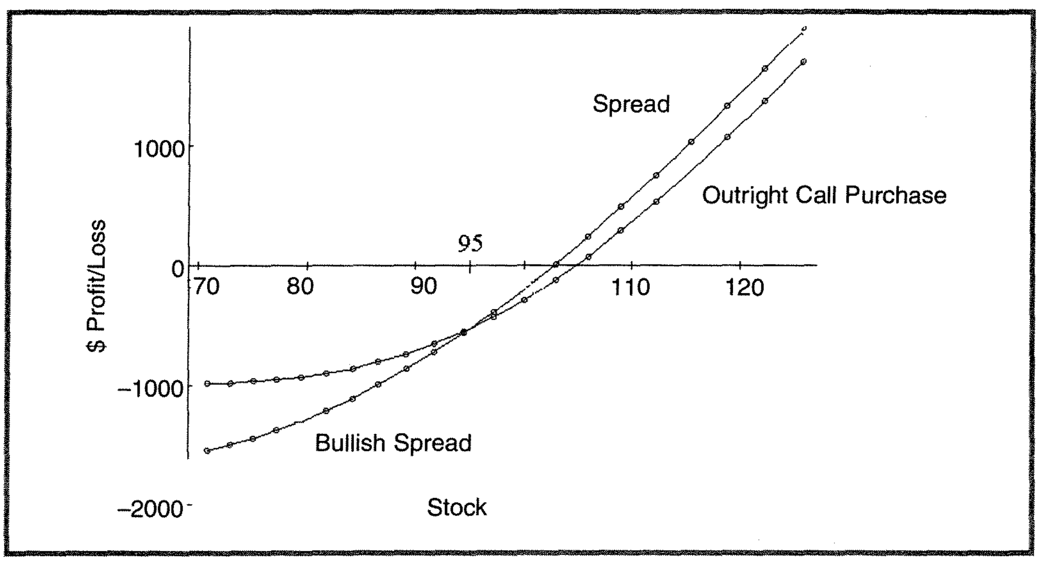


First, one can see that the bullish spread position has a total risk of 17 points, if XYZ is below 80 (the lower striking price of the put spread) at expiration. That, of course, is more than the 10-point cost of the July 100 call by itself, but if one is using a trading stop of any sort, he probably would not be at risk for the entire 17 points, since he wouldn't hold on while the stock fell all the way to 80 and below. Note also that the bullish spread position would have a loss of 10 points (the same as the call) at a price of 87 for the common at expiration. Hence, the combined position actually has *less* risk than the outright call purchase as long as XYZ is 87 or higher at expiration. Since one is supposedly bullish initially when establishing this strategy, it seems likely that he would figure the stock would be 87 or higher at expiration.

Figure 37-7 offers another comparison, that of the two positions after 30 days have passed. Note that the spread position once again does better on the upside and worse on the downside. The crossover point between the two curves is at about a price of 95. That is, if XYZ is above 95 in 30 days, the bullish spread position will outperform the call buy.

One final point should be made regarding the investment required. The outright call purchase requires an investment of $1,000 – the cost of the long call. The bullish spread position requires that $1,000, plus $700 for the spread (10-point difference in the strikes, less the 3-point credit received for selling the spread). That's a total of $1,700, the risk of the bullish spread position. Hence, the *rate of return* might favor the outright call purchase, depending on how far the stock rallies.

FIGURE 37-7.
Results of the two positions in 30 days.



Overall, the bullish spread position is an attractive alternative to an outright call purchase, especially when the call is overpriced. The spread does risk a greater amount of money if the underlying stock should collapse heavily. Still, if one is truly bullish, and if one employs a reasonably tight downside stop on his entire position, this spread can perform better than the outright purchase of an overpriced call.

VERTICAL PUT SPREADS

Also of interest is the effect that implied volatility has on put spreads. One of the more popular strategies involving puts is the sale of a credit spread – a bull spread with puts. Assume that a stock is selling at 100, and one is going to *sell a put with a 110 strike and buy a put with a 90 strike.* That is a put credit (bull) spread. Also assume that the options have four months of life remaining. (See Table 37-8.)

One would not rationally sell this credit spread if implied volatility were as low as 20%, because at that low level of volatility, the in-the-money December 110 put is trading for 10 dollars – parity – and thus would immediately be at risk of early assignment. But one can see that an increase in implied volatility increases the value of the spread. Now, if one had sold this spread to begin with, he would thus be *losing* money when implied volatility increased. This was proven with call bull spreads, too: They lose money when implied volatility increases. Conversely, of course, the put credit spread *makes* money when implied volatility decreases.

What happens after thirty days have passed? Figure 37-8 shows just two cases – implied volatility at 30% and implied volatility at 80%. One can surmise that other levels of implied volatility between 30% and 80% would have profit graphs that lie between the two shown in Figure 37-8.

TABLE 37-8

Implied Volatility	90–110 Put Bull Spread (Theoretical Value)
20%	9.15 cr*
30%	9.70 cr
40%	10.12 cr
50%	10.46 cr
60%	10.78 cr
70%	11.05 cr
80%	11.33 cr

*Short option trading at parity

First, one can see that the bullish spread position has a total risk of 17 points, if XYZ is below 80 (the lower striking price of the put spread) at expiration. That, of course, is more than the 10-point cost of the July 100 call by itself, but if one is using a trading stop of any sort, he probably would not be at risk for the entire 17 points, since he wouldn't hold on while the stock fell all the way to 80 and below. Note also that the bullish spread position would have a loss of 10 points (the same as the call) at a price of 87 for the common at expiration. Hence, the combined position actually has *less* risk than the outright call purchase as long as XYZ is 87 or higher at expiration. Since one is supposedly bullish initially when establishing this strategy, it seems likely that he would figure the stock would be 87 or higher at expiration.

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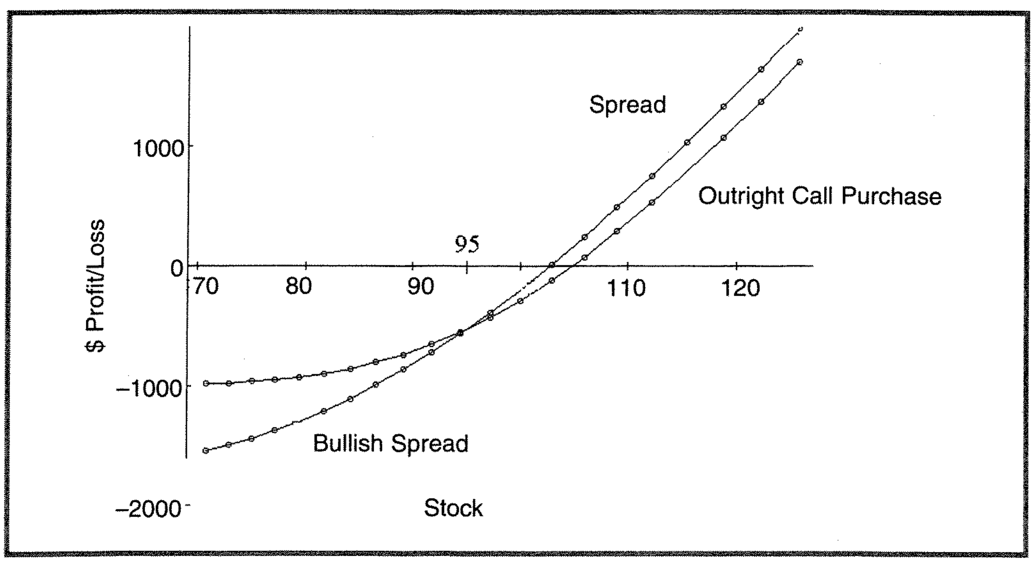
FIGURE 37-7.
Results of the two positions in 30 days.



Overall, the bullish spread position is an attractive alternative to an outright call purchase, especially when the call is overpriced. The spread does risk a greater amount of money if the underlying stock should collapse heavily. Still, if one is truly bullish, and if one employs a reasonably tight downside stop on his entire position, this spread can perform better than the outright purchase of an overpriced call.

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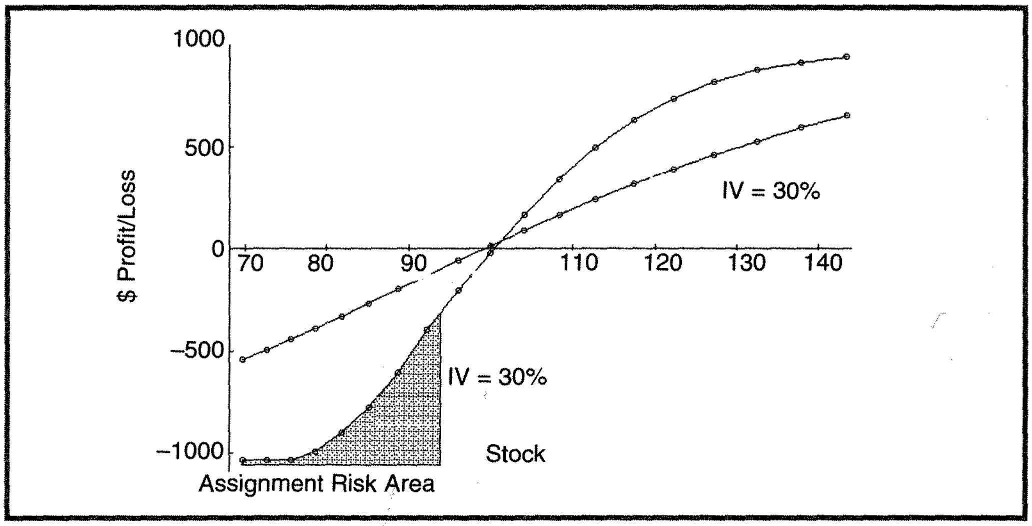
80%	11.33 cr

*Short option trading at parity

FIGURE 37-8.
Put credit (bull) spread profit in 30 days.



First, one can observe that a bull put spread does not widen out to anywhere near its maximum potential if implied volatility increases. The same thing was seen with the call bull spread in the previous section. But a put bull spreader is caught in another trap: If implied volatility falls and the stock falls too, the risk of early assignment materializes quicky. Note the shaded area at the lower left of the graph, extending from a price of about 94 on down. After thirty days (so there would be three months life remaining at that point in time), if implied volatility is 30%, the 110 put (the short put) would be trading at parity for stock prices of 94 and below. Thus, it would be at risk of early assignment. If implied volatility were even lower, the puts would be at parity for much higher stock prices.

Now, in and of itself, early assignment on an equity or futures put spread is not necessarily a terrible thing. There will be a request for additional margin (because the stock has to be paid for or the futures contract margined), but the risk is still the same in dollar terms. Of course, the request for extra margin could be backbreaking for a stock trader if he can't afford to fully pay for the stock, and the early assignment would probably incur additional commission costs, too. However, with cash-based index options there is a more serious increase in risk after an early assignment, because one is left with only the long side of the spread. If that option happens to have substantial value, then there is considerable risk if the underlying should quickly move higher. In fact, by the time one unwinds the spread, he might actually end up losing more than his original limited risk amount – all due to the early assignment. (This could happen if the underlying first plunges in price, placing both options

deeply in-the-money, after which one gets assigned on the short put option, followed by the underlying then dramatically rising in price.)

The lesson to be learned is this: *If one is considering using bull spreads in which at least one of the options is at- or in-the-money, then a call bull spread is a superior choice over a put bull spread.* Early assignment is not really a consideration for most call spreads.

In both cases, however, a more serious problem exists, and that is that the spread does not widen out much even when the stock makes a nice bullish move. Thus, once again it is actually better to buy a call option in most cases than to use the bull spread, because profits are larger and an increase in implied volatility is a favorable thing for an outright call buyer.

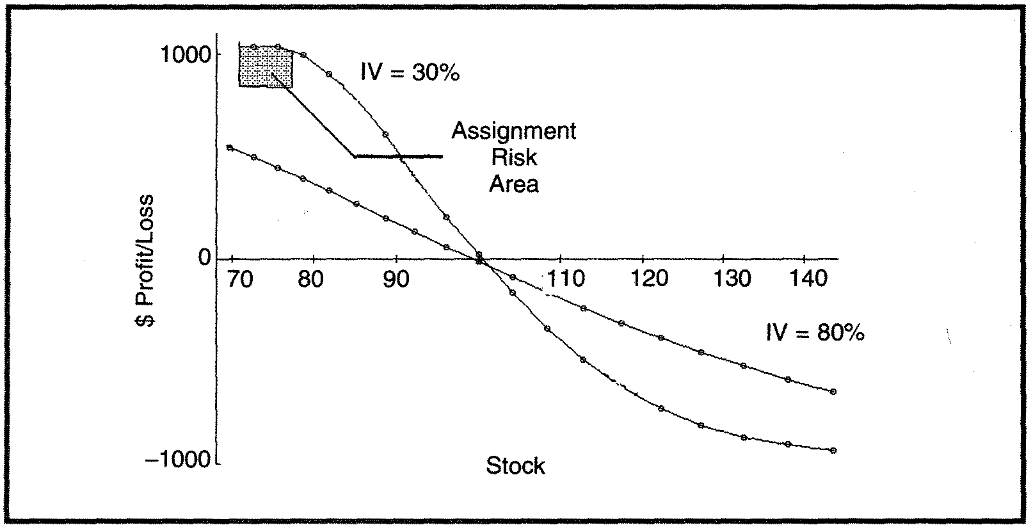
Note that these effects are similar, but much less pronounced, for out-of-the-money put credit spreads. Still, it should be noted that an increase in implied volatility will harm an out-of-the-money put credit spread, too. Hence, if the underlying goes into a rapid fall (crash, plunge), then implied volatility usually increases quickly and dramatically. So an out-of-the-money credit spreader is hit with the double whammy of expanding implied volatility and the fact that the underlying is fast approaching the strike price of his options, thereby expanding the price of the spread.

PUT BEAR SPREADS

What about the put spread in a bearish situation? In a vertical put spread one *buys* the put with the higher strike and *sells* the put with the lower strike to construct a simple put bear spread. Actually, a sudden increase in implied volatility is of help to the bear put spread. That is, the spread will widen out slightly. To verify this, look at Table 37-8 again, only now imagine that one is *buying* the spread for a debit. Note that the smallest debit is at the lower implied volatility – 9.15 debit with IV at 30%. If implied volatility were to instantaneously jump to 80%, the spread would widen out to 11.33 debit. A very quick profit could be had. So there's a difference right away between a debit call bull spread (which *loses* money when implied volatility suddenly increases) and a debit put bear spread.

Unfortunately, the other major drawback – that the spread doesn't widen out much if the underlying makes a favorable move – is still true. Figure 37-9 shows a bear put spread, 30 days hence, for two different implied volatilities. Once again, the lower-volatility spread widens out more quickly, because both options tend to go to parity in that case. In fact, one can see on the graph that there is early assignment risk in the low-volatility case, below a price of about 77 on the stock. That is not a

FIGURE 37-9.
Bear put spread profit in 30 days.



problem, though, since the spread would have widened to its maximum potential in that case and could just be removed when the risk of early assignment materialized.

When implied volatility remains high, though, the spread doesn't widen out much, even when the stock drops a lot after 30 days. Since it is common for implied volatility to rise (even skyrocket) when the underlying drops quickly, the put bear spread probably won't widen out much. That may not be a psychologically pleasing strategy, because one won't make the level of profits that he had hoped to when the underlying fell quickly.

Once again, it seems that the outright purchase of an option is probably superior to a spread. In these cases, it is true with respect to puts, much as it was with call options. Spreading often unnecessarily complicates a trader's outlook.

CALENDAR SPREADS

In the earlier chapter on calendar spreads, it was mentioned that an increase in implied volatility will cause a calendar spread to widen out. Both options will become more expensive, of course, since the increase in implied volatility affects both of them, but the *absolute* price change will be greatest in the long-term option. Therefore, the calendar spread will widen. This may seem somewhat counterintuitive, especially where highly volatile stocks are concerned, so some examples may prove useful.

Example: Suppose that XYZ is trading at 100, and one is interested in a calendar spread in which an August (5-month) call is bought and a May (2-month) call is sold. For the purpose of this example, it will be assumed that these are both at-the-money options. First, the vegas of the two options will be examined, assuming that implied volatility is 40%:

Stock: 100
Implied Volatility:

40% Option	Theoretical Price	Vega
Sell May 100 call	6.91	0.162
Buy August 100 call	11.22	0.251

In theory, this spread should be worth 4.31 – the difference in the theoretical values. Perhaps more important, it has volatility exposure of 0.089 – the difference between the vega of the long call and that of the short call. Since vega is positive, this means that an *increase* in implied volatility will be beneficial to the spread. In other words, one can expect the spread to widen if implied volatility rises, and can expect the spread to shrink if implied volatility declines.

The following table can also be constructed, showing the theoretical value of the spread at various levels of implied volatility. This table makes the assumption that very little time has passed (only one week) before the implied volatility changes take place. It also assumes that the stock is still at 100.

Stock Price: 100
One week after the spread has been established:

Implied Volatility	Theoretical Spread Value
20%	2.58
30%	3.52
40%	4.46
50%	5.40
60%	6.33
80%	8.16
100%	12.92

From the above data, it is quite obvious that implied volatility levels have a huge effect on the value of a calendar spread. The actual initial contribution of time decay is rather small in comparison. For example, note that if volatility remains unchanged at 40%, then the spread will have widened only slightly – to 4.46 from 4.31 – after the passage of one week's time. That is small in comparison to the changes dictated by volatility expansion or contraction.

A common mistake that calendar spreaders make is to think that such a spread looks overly attractive on a very volatile stock. Consider the same stock as above, still trading at 100, but for some reason implied volatility has skyrocketed to 80% (perhaps a takeover rumor is present).

Stock: 100
Implied Volatility: 80%

Call	Theoretical Value
May 100 call	12.55
June 100 call	16.81

On the surface, this seems like a very attractive spread. There are two months of life remaining in the May options (and three months in the Junes) and the spread is trading at 4.36. However, both options are completely composed of time value premium, and most certainly the June 100 call would be worth far more than 4.36 when the May expires, if the stock is still near 100. The fact that many traders miss when they think of the calendar spread this way is that the June call will only be worth "far more than 4.36" if implied volatility holds up. If implied volatility for this stock is normally something on the order of 40%, say, then it is probably not reasonable to expect that the 80% level will hold up. Just for comparison, note that if the stock is at 100 at May expiration – the maximum profit potential for such a calendar spread – the June 100 call, with implied volatility now at 40%, and with one month of life remaining, would be worth only 4.77. Thus the spread would only have made a profit of a few cents (4.36 to 4.77), and if the underlying stock were farther from the strike price at expiration, there would probably be a loss rather than a profit.

The point to be remembered is that a calendar spread is a "long volatility" play (and a reverse calendar spread is just the opposite). Evaluate the position's risk with an eye to what might happen to implied volatility, and not just to where the stock price might go or how much time decay there might be in the position.

RATIO SPREADS AND BACKSPREADS

The previous descriptions in this chapter describe fairly fully and accurately what the effect of volatility changes are. More complicated strategies are usually nothing more than combinations of the strategies presented earlier, so it is easy to discern the effect that changes in implied volatility would have; just combine the effects on the simpler strategies. For example, a ratio call write is really just the equivalent of a straddle sale – a strategy whose volatility ramifications are fairly simple to understand.

Ratio spreads, on the other hand, might not be as intuitive to interpret, but they are fairly simple nonetheless. A call ratio spread is really just the combination of some

call bull spreads and some naked call options. For example, a call ratio spread might consist of buying an XYZ July 100 call and selling two XYZ July 120 calls. If one were to break it down into its components, this spread is really long one XYZ July 100–120 call bull spread, plus an additional naked July 120 call.

We already know that an increase in implied volatility is very detrimental to a naked call option. In addition, it was shown earlier than an increase in implied volatility actually *harms* the value of an at-the-money call bull spread. So, for a ratio call spread, *both* components are harmed by an increase in implied volatility. Conversely, a *decrease* in implied volatility would be beneficial to a ratio spread, but where naked options are concerned, one should be more mindful of his risk than of this reward.

It was also shown previously that a call bull spread does *not* widen out much if the underlying stock makes a quick upward move. The spread won't widen out to its maximum profit potential until expiration draws nigh or the stock is well above the upper strike in the spread. This scenario also does not bode well for the ratio call spread. Suppose that the underlying stock suddenly jumps upward and implied volatility increases at the same time. That combination is seen quite frequently, especially if the stock were previously "dull" or if there is some sort of active corporate (takeover) rumor. The call ratio spread will fare miserably under these conditions, because the increase in stock price certainly harms the naked call position and the bull spread is not widening out much to compensate for it. In addition, the increase in implied volatility is working against both components.

The same sort of thing happens with put ratio spreads. They are really the combination of a put bear spread plus some additional naked put options. If the underlying falls in price, while implied volatility increases – a very common occurrence in all markets – then the put ratio spread will fare poorly. In fact, implied volatility sometimes *explodes* if the underlying falls very rapidly (crashes), so the ratio put spreader should clearly assess his risk in this light.

In summary, a trader utilizing ratio spread strategies should clearly understand and attempt to analyze the risks of an increase in implied volatility. This includes not only assessing the vega risk of the spread, but also using a probability calculator with some inflated volatility estimates to see just what the chances are of the spread getting into real trouble.

BACKSPREADS

A call backspread is merely the opposite of a call ratio spread. Thus, any of the earlier commentary about how an increase in implied volatility is detrimental to a ratio spread can be reversed when discussing the backspread. An increase in implied volatility will be beneficial to a backspread strategy, while a decrease in implied

volatility will be slightly harmful to the spread. However, since risk is limited in a backspread, such a decrease in implied volatility would not have catastrophic consequences unless one had overcommitted his funds to one position.

SUMMARY

In general, one can always determine the exposure of his position to volatility by computing the vega of this position. However, it is also useful for a strategist to have some general feeling for how implied volatility will affect his positions and strategies. Thus, this chapter was designed to point out the most common effects that changes in implied volatility will have on the basic types of option strategies. Once one has a feeling for his exposure to volatility, he can then assess whether an adverse volatility movement is likely. For example, if an increase in implied volatility would be harmful, and the strategist sees that current levels of implied volatility are quite low in comparison to historical norms, then perhaps he should remove or adjust the position.

Volatility and the price of the underlying are the two major components affecting profitability for most option positions. Time decay is only most pertinent as expiration approaches. Yet, many traders concentrate greatly on potential price movements of the underlying, often while ignoring what changes in implied volatility could do. That is a mistake, for the most knowledgeable option traders plan for volatility risk at all times. Understanding and handling that risk can have a positive effect on an option trader's profits.

CHAPTER 38

The Distribution of Stock Prices

Much of the work that has been done in statistics and related areas regarding the stock market has made the assumption that stock prices are distributed normally, or more specifically, *lognormally*. In actual practice, this is usually an incorrect assumption. For the option strategist, this means that some of the things one might believe about certain option strategies having an advantage over certain *other* option strategies might be incorrect. In this chapter, a number of facts concerning stock price distribution will be brought to light, including how it might affect the option strategist.

MISCONCEPTIONS ABOUT VOLATILITY

Statistics are used to estimate stock price movement (and futures and indices as well) in many areas of financial analysis. Many authors have written extensively about the use of probabilities to aid in choosing viable option strategies. Stock mutual fund managers often use volatility estimates to help them determine how risky their portfolios are. The uses are myriad. Unfortunately, almost all of these applications are wrong! Perhaps *wrong* is too strong a word, but almost all estimates of stock price movement are overly conservative. This can be very dangerous if one is using such estimates for the purposes of, say, writing naked options or engaging in some other such strategy in which volatile stock price movement is undesirable.

As a review for those not familiar with mathematical distributions, the lognormal distribution is what's commonly used to describe stock prices because its shape is intuitively similar to the way stocks behave – they can't go below zero, they can rise to infinity, and most of the time they don't go much of anywhere. On top of that, the distribution's shape is based on the *historical volatility* of the underlying instrument. In a lognormal distribution (and normal distribution, too), stocks remain within 3 standard deviations of their current price 99.74% of the time. A standard deviation

(sigma) is a statistical measure whose absolute distance grows larger with time, and it is something that can be easily calculated for any individual stock or futures contract, using historical prices.

There are great differences between the way stocks *really* behave and the assumptions that many mathematical models make about the way stocks *theoretically* behave. The problem lies in assuming that normal or lognormal distribution predicts stock price movements. Such an assumption does not allow for the occasional wild days that many stocks, some futures, and the relatively rare index undergo. The normal distribution pretty much says that a stock can't rise or fall by more than 3 standard deviations. In fact, according to math, the probability of something that behaves according to the normal distribution (the "classic" bell curve is a normal distribution) moving three standard deviations is 0.0013 (or just a little more than one tenth of one percent). So, if there are 2,500 optionable stocks, say, then one would expect maybe 3 of them to move three standard deviations on any given day.

However, in real market trading, there are routinely moves in stocks of more than 3 standard deviations – some as much as 5 standard deviations or more. Statistically (if the lognormal distribution were correct), one would only expect to see moves of that size maybe once in his lifetime, yet there are five or ten *each day*! Specifically, the normal distribution's probability of something being able to move 8 standard deviations is 0.000000000000000629. This number is so small that one would expect to see only one such occurrence in the known life of the universe, if prices were truly distributed via the normal distribution. If the normal distribution were the correct format for stock prices, such a small probability would indicate that one would not see an 8-standard deviation move until *billions* of trading days had passed. However, one can find several such moves on nearly any trading day, and it is not necessary to use some low-priced, oddball stock that dropped from 1 to .75 or some such nonsense as an example.

If those numbers don't convince you that stocks aren't lognormally distributed, perhaps the following study will. Table 38-1 lists moves that occurred on Monday, April 5, 1999 – a day that was somewhat volatile (the Dow was up 174 points).

There were many other substantial moves that day. In the list in Table 38-1, all three that fell in price were on earnings warnings, and the two that rose were just swept up in the that day's version of the Internet mania. All in all, 58 stocks had moves of greater than *four* standard deviations on that day! It was not any sort of special day, although it did fall during earnings warnings season and in the midst of the Internet mania. But the fact that the market is somewhat volatile shouldn't justify all of these huge moves, if one still adheres to the belief that lognormal is the correct distribution.

TABLE 38-1.

Stock	Last Sale	Change	Standard Deviations
Aspect Devt (ASDV)	8	−14.38	−31.2
Axent (ANT)	8	−12	−11.2
Ameritrade (AMTD)	91.63	+29.13	+ 8.6
CheckPoint (CHKP)	28.75	−10.75	− 8.4
Sabre Gp. (TSG)	55	+ 8.50	+ 8.0

So, just to make sure that wasn't a bad sample, a low-volatility period was chosen to sample. Since the inception of the CBOE's Volatility Index ($VIX) trading, its lowest market volatility readings were in January and July of 1993. The lowest single day was July 25, 1993. On that day, *twelve* stocks had moves of more than four standard deviations. They included some big names, like Adaptec (ADPT), Bethlehem Steel (BS), U.S. Steel (X), Chiquita Brands (CQB), and Novell (NOVL).

The only way to tell how many standard deviations a stock has moved is to use its historical volatility – say, the 20-day historical volatility, for example – in the measurement. Thus, a 4-point move for a nonvolatile stock like Bethlehem Steel in 1993 pales in comparison to Ameritrade's 29-point gain in 1999 (Table 38-1), but both were large moves in terms of *standard deviations*, determined by using each stock's historical volatility.

As another test, prices from October 8, 1998 – the day the market bottomed after a severe and rather swift decline brought on by Russian debt problems (it was a very volatile day after several volatile weeks of trading) – were tested to see how many stocks had moves of four standard deviations or more. There were 33, but that seemingly low number reflects the fact that many stocks' 20-day historical volatilities were already well inflated by October 8, 1998. On that day, the Utility Index ($UTY) fell over 14 points, which was about 5.5 standard deviations. American Power Conversion (APCC) was *up* over six points that day, to 36.88 – a *gain* of over five standard deviations.

Perhaps you might think that these one-day moves overstate things, that over a more prolonged period of time, the lognormal distribution fits better. A study was constructed to measure the volatility over a slightly longer time period. The results of the study not only confirmed our suspicions, but actually were somewhat startling in quantifying just how volatile certain individual issues can be.

The first example comprised the 30-trading day period between October 22, 1999 and December 7, 1999. There is nothing magical about these dates; that just happened to be the most recent 30-day period for which data was available when the study was conducted.

This particular period started out as a rather normal one in the market – in fact, prices had perhaps been a little less volatile than normal leading into that period. To support that statement, it should be noted that on October 22, the CBOE's Volatility Index ($VIX) stood at about 23 – a relatively middle-of-the-range level. So it wasn't as if this was an extremely volatile period.

The example is simple enough. The performance of 2,900 optionable stocks was measured to see if, beginning on October 22, 1999, any of them experienced moves of greater than three standard deviations at any time during the 30-day period. The standard deviation was based on the 20-day historical volatility of each individual stock. Obviously, a stock would have to make a much greater move to exceed the 3-standard deviation limit if it waited until the end of the 30-day period to do it, as opposed to making a big move on the first day. So, before reading on, take a guess: How many of the stocks do you think exceeded three standard deviation moves at some point during the 30 days? Remember that the lognormal distribution would predict virtually *no* moves of that size. The answer is in the next paragraph.

There were more stocks that had large upside moves than there were that had large downside moves over the period in question. That isn't too surprising, since the market moved up during that time. The final total showed this: Of the 2,900 stocks, nearly 650 experienced moves of 3 standard deviations or more during the life of the study, including 65 that moved more than six standard deviations. If the lognormal distribution were correct, the two lines in Table 38-2 would be filled with zeroes. This clearly shows stocks during this period didn't conform to the "normal" expectations. The study results are shown in Table 38-2. (Note that "σ" is the greek letter sigma, which mathematicians traditionally use to denote standard deviations, so 3σ means three standard deviations.)

TABLE 38-2
Stock price movements.

Total Stocks: 2,888				Dates: 10/22/99–12/7/99	
	3σ	4σ	5σ	$>6\sigma$	Total
Upside Moves:	309	116	44	47	516
Downside Moves:	69	29	15	19	132
Total number of stocks moving $>=3\sigma$: 648 (22% of the stocks studied)					

The largest move was registered by a stock that jumped from a price of 5 to nearly 12 in about six trading days. One of the bigger downside movers was a stock that fell from about 20 to 8 in a matter of a couple of weeks, with most of the damage occurring in a two-day time period.

Lest you think that this example was biased by the fact that it was taken during a strong run in the NASDAQ market, here's another example, conducted with a different set of data – using stock prices between June 1 and July 18, 1999 (also 30 trading days in length). At that time, there were fewer large moves; about 250 stocks out of 2,500 or so had moves of more than three standard deviations. However, that's still one out of ten – way more than you've been led to expect if you believe in the normal distribution. The results are shown in Table 38-3.

TABLE 38-3.
More stock price movements.

Total Stocks: 2,447				Dates: 6/1/99–7/18/99	
	3σ	**4σ**	**5σ**	**>6σ**	**Total**
Upside Moves:	104	28	13	12	157
Downside Moves:	54	19	7	14	94
Total number of stocks moving >=3σ: 251 (10% of the stocks studied)					

Finally, one more example was conducted, using the least volatile period that we had in our database – July of 1993. Those results are in Table 38-4.

TABLE 38-4.
Stock price movements during a nonvolatile period.

Total Stocks: 588				Dates: 7/1/93–8/17/93	
	3σ	**4σ**	**5σ**	**>6σ**	**Total**
Upside Moves:	14	5	1	1	21
Downside Moves:	28	5	3	4	40
Total number of stocks moving >=3σ: 61 (10% of the stocks studied)					

At first glance, it appears that the number of large stock moves diminished dramatically during this less volatile period in the market – until you realize that it still represents 10% of the stocks in the study. There were just a lot fewer stocks with listed options in 1993 than there were in 1999, so the database is smaller (it tracks only stocks with listed options). Once again, this means that there is a far greater chance for large standard deviations moves – about one in ten – than the nearly zero percent chance that the lognormal distribution would indicate.

VOLATILITY BUYER'S RULE!

The point of the previous discussion is that stocks move a lot farther than you might expect. Moreover, when they make these moves, it tends to be with rapidity, gener-

ally including gap moves. There are not always gap moves, though, over a study of this length. Sometimes, there will be a more gradual transition. Consider the fact that one of the stocks in the study moved 5.8 sigma in the 30 days. There weren't any huge gaps during that time, but anyone who was short calls while the stock made its run surely didn't think it was a gradual advance.

So, what does this information mean to the average option trader? For one, you should certainly think twice about selling stock options in a potentially volatile market (or any market, for that matter, since these large moves are not by any means limited to the volatile market periods). This statement encompasses naked option selling, but also includes many forms of option selling, because of the possibilities of large moves by the underlying stocks.

For example, covered call writing is considered to be "conservative." However, when the stock has the potential to make these big moves, it will either cause one to give up large upside profits or to suffer large downside losses. (Covered call writing has limited profit potential and relatively large downside risk, as does its equivalent strategy, naked put selling.) When these large stock moves occur on the upside, a covered writer is often disappointed that he gave up too much of the upside profit potential. Conversely, if the stock drops quickly, and one is assigned on his naked put, he often no longer has much appetite for acquiring the stock (even though he said he "wouldn't mind" doing so when he sold the puts to begin with).

Even spreading has problems along these lines. For example, a vertical spread limits profits so that one can't participate in these relatively frequent large stock moves when they occur.

What can an option seller do? First, he must carefully analyze his position and allow for much larger stock movements than one would expect under the lognormal distribution. Also, he must be careful to sell options only when they are expensive in terms of implied volatility, so that any decrease in implied will work in his favor. Probably most judicious, though, is that an option seller should really concentrate on indices (or perhaps certain futures contracts), because they are statistically much less volatile than stocks. Hard as it is to believe, futures are less volatile than stocks (although the leverage available in futures can make them a riskier investment overall).

Two 30-day studies, similar to those conducted on stocks, were run on optionable indices, covering the same time periods: 10/22/99 to 12/7/99 for one study and 7/1/93 to 8/17/93 for the other. The results are shown in Tables 38-5 and 38-6. This may be a somewhat distorted picture, though, because many of these indices overlap (there are four Internet indices, for example). The largest mover was the Morgan Stanley High-Tech Index (5 standard deviations), but it should also be noted that something that is considered fairly tame, such as the Russell 2000 ($RUT), also had a 3-standard deviation move in one study. The first study showed that 37% of the

TABLE 38-5.
Index price movements.

Total Indices: 135				Dates: 10/22/99–12/7/99	
	3σ	**4σ**	**5σ**	**>6σ**	**Total**
Upside Moves:	32	15	3	0	50
Downside Moves:	None				

TABLE 38-6.
Index price movements, least volatile period.

Total Indices: 66				Dates: 7/1/93–8/17/93	
	3σ	**4σ**	**5σ**	**>6σ**	**Total**
Upside Moves:	1	1	0	0	2
Downside Moves:	3	0	0	0	3
Total number of indices moving >=3σ: 5 (8% of the indices studied)					

indices made oversized moves – probably a bias because of the strong Internet stock market during that time period. The low-volatility period showed a more reasonable, but still somewhat eye-opening, 8% making moves of greater than three standard deviations. So, even selling index options isn't as safe as it's cracked up to be, when they can make moves of this size, defying the "normal" probabilities.

Since that period in 1999 was rather volatile, and all on the upside, the same study was conducted, once again using the least volatile period of July 1993.

In Table 38-6, the numbers are lower than they are for stocks, but still much greater than one might expect according to the lognormal distribution.

These examples of stock price movement are interesting, but are not rigorously complete enough to be able to substantiate the broad conclusion that stock prices don't behave lognormally. Thus, a more complete study was conducted. The following section presents the results of this research.

THE DISTRIBUTION OF STOCK PRICES

The earlier examples pointed out that, at least in those specific instances, stock price movements don't conform to the lognormal distribution, which is the distribution used in many mathematical models that are intended to describe the behavior of stock and option prices. This isn't new information to mathematicians; papers dating back to the mid-1960s have pointed out that the lognormal distribution is flawed. However, it isn't a terrible description of the way that stock prices behave, so many applications have continued to use the lognormal distribution.

Since 1987, the huge volatility that stocks have exhibited – especially on certain explosive down days such as the Crash of '87 or the mini-crash of April 14, 2000 – has alerted more people to the fact that something is probably amiss in their usual assumptions about the way that stocks move. The lognormal distribution "says" that a stock really can't move farther than three standard deviations (whether it's in a day, a week, or a year). Actual stock price movements make a mockery of these assumptions, as stocks routinely move 4, 5, or even 10 standard deviations in a day (not all stocks, mind you, but some – many more than the lognormal distribution would allow for).

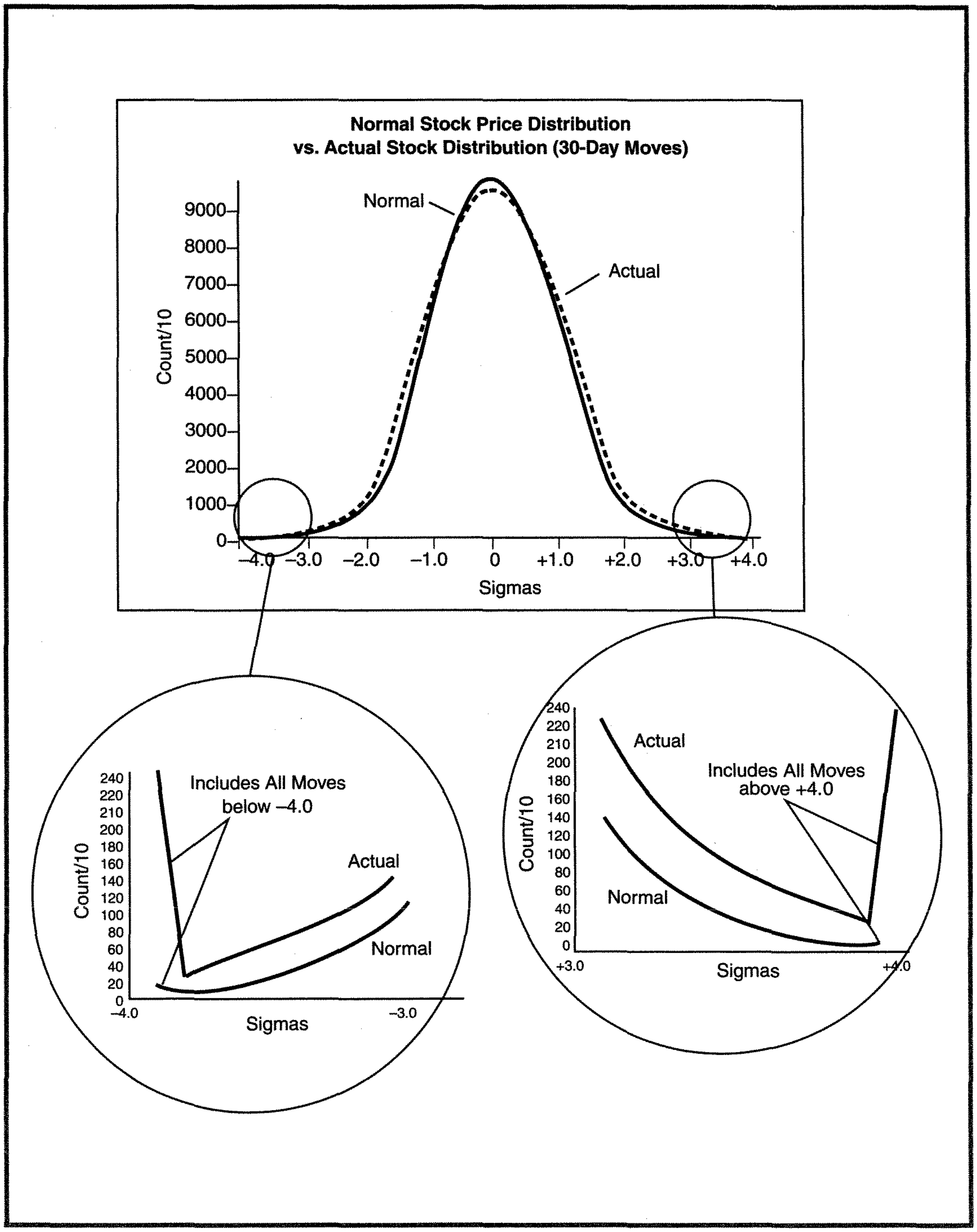
In order to further quantify these thoughts, computer programs were written to analyze our database of stock prices, going back over six years. As it turns out, that is a short period of time as far as the stock market is concerned. While it is certainly a long enough time to provide meaningful analysis (there are over 2.5 million individual stock "trading days" in the study), it is a biased period in that the market was rising for most of that time.

THE "BIG" PICTURE

The first part of the analysis shows that the total distribution of stock prices conforms pretty much to what the expectations were for the study, and – not surprisingly – to what others have written about the "real" distribution of stock prices. That is, there is a much greater chance of a large standard deviation move than the lognormal distribution would indicate. The high probabilities on the ends of the distribution are called "fat tails" by most mathematicians and stock market practitioners alike. These "tails" are what get option writers in trouble – and perhaps even leveraged stock owners – because margin buyers and naked writers figure that they will never occur. It is not intuitively obvious to them and to many other stock market participants that stock prices behave in this manner.

The graphs in Figure 38-1 show this total distribution. The top graph is that of the lognormal distribution and the actual distribution, using the data from September 1993 to April 2000 – overlaid upon each other. The actual distribution was drawn using 30-day moves (i.e., the number of standard deviations was computed by looking at the stock price on a certain day, and then where it was 30 calendar days later). The x-axis (bottom axis) shows the number of standard deviations moved. Note that the curves have the shape of a *normal* distribution rather than a *lognormal* distribution, because the x-axis denotes number of standard deviations moved rather than stock prices themselves. For this reason, the term "normal" will be used in the remainder of this section; it should be understood that it is the distribution of standard deviations that is "normal," while the distribution of the stock prices measured by those standard deviation moves is "lognormal." The y-axis (left axis) shows the "count" – the number of times out of the 2.5 million data points computed that each point on the x-axis actually occurred (in the

FIGURE 38-1.
Stock price distribution is not "normal."



case of the "actual" distribution) or could be expected to occur (in the case of the "normal" distribution). The notation on the y-axis shows the actual count divided by 10. So, for example, the highest point (0 standard deviations moved) for the "normal" distribution shows that about 95,000 times out of 2.5 million, you could expect a stock to be unchanged at the end of 30 calendar days.

At first glance, it appears that the two curves have almost identical shapes. Upon closer inspection, however, it is clear that they do not, and in fact some rather startling differences are evident.

Fat Tails

Figure 38-1 shows the fat tails quite clearly. Magnified views of the fat tails are provided to show you the stark differences between the theoretical ("normal") distribution and actual stock price movements. Consider the downside (the lower left circled graph in Figure 38-1). First, note that both the "actual" and "normal" graphs lift up at the end – the leftmost point. This is because the graph was terminated at –4.0 standard deviations, and all moves that were greater than that were accumulated and graphed as the leftmost data point. You can see that the "normal" distribution expects fewer than 200 moves out of 2.5 million to be of -4.0 standard deviations or more (yes, the "normal" distribution *does* allow for moves greater than 3 standard deviations; they just aren't very probable). On the other hand, actual stock prices – even during the bull market that was occurring during the term of the data in this study – fell more than –4.0 standard deviations nearly 2,500 times out of 2.5 million. Thus, in reality, there was really more than 12 times the chance (2,500 vs. 200) that stocks could suffer a severely dramatic fall, when comparing actual to theoretical distribution. Also notice in that lower left circle that the actual distribution is greater than the normal distribution all along the graph.

The upside fat tail shows much the same thing: Actual stock prices can rise farther than the normal distribution would indicate. At the extreme – moves of +4.0 standard deviations or more – there were about 2,000 such moves in actual stock prices, compared with fewer than 100 expected by the normal distribution. Again, a very large discrepancy: twenty-to-one.

Inflection Points

If the actual distribution is higher at both ends, it must be lower than the normal distribution *somewhere,* because there are only a total of 2.5 million data points plotted. It turns out in this case that the normal distribution is higher (i.e., is expected to occur more often than it actually does) between –2.5 standard deviations and +0.5 standard deviations. Those are the points where the two curves cross over each other – the inflection points. Outside of that range, the actual distribution is more frequent than it was expected to be.

It is probably the case that this data reflected an overly bullish period. That is, actual stock prices rose farther than they were expected to, not necessarily at the tails, but in the intermediate ranges, say between +0.5 and +1.5 standard deviations. This does not change the results of the study as far as the tails go, but one may not always be able to count on intermediate upside moves being more frequent than predicted.

SIDE BENEFITS OF THIS STUDY

In the course of doing these analyses, a lot of smaller distributions were calculated along the way. One of these is the distribution on any individual trading day that was involved in the study. Now, one must understand that one day's trading yields only about 3,000 data points (there were about 3,000 stocks in the database), so the resulting curve is not going to be as smooth as the ones shown in Figure 38-1. Nevertheless, some days could be interesting. For example, consider the day of the mini-crash, Friday, April 14, 2000. The Dow-Jones Industrials were down 617 that day; the S&P 500 index was down 83 points; and the NASDAQ-100 was down 346. Except for the Crash of 1987, these were the largest single-day declines in history. The distribution graph is shown in Figure 38-2.

First of all, notice how heavily the distribution is skewed to the left; that agrees with one's intuition that the distribution should be on the left when there is such a serious down day as 4/14/2000. Also, notice that the leftmost data point – representing all moves of –4.0 standard deviations and lower, shows that about 750 out of the 2,984 stocks had moves of that size! That is unbelievable, and it really points out just how

FIGURE 38-2.
Stock price distribution for 4/14/2000 – 2,984 Stocks in Study.

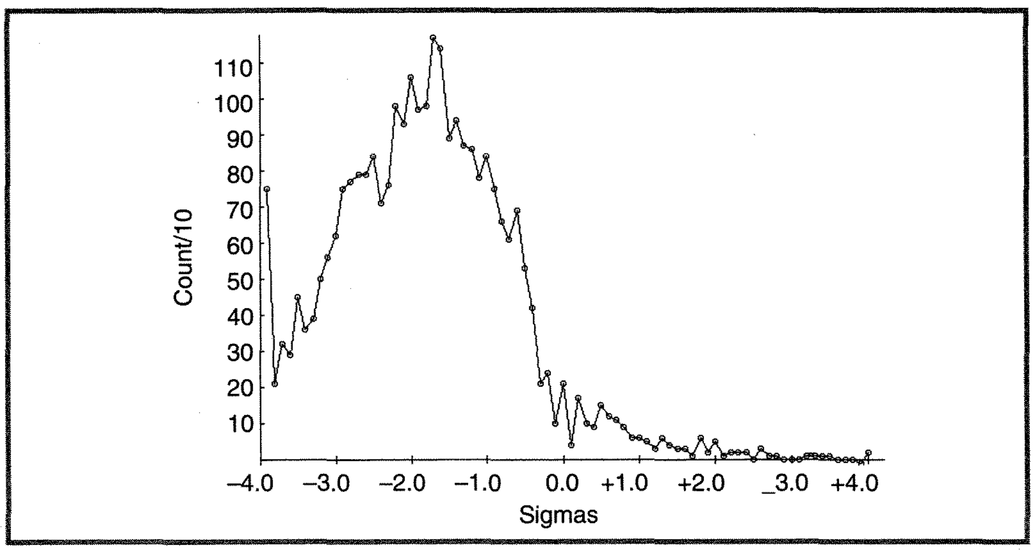
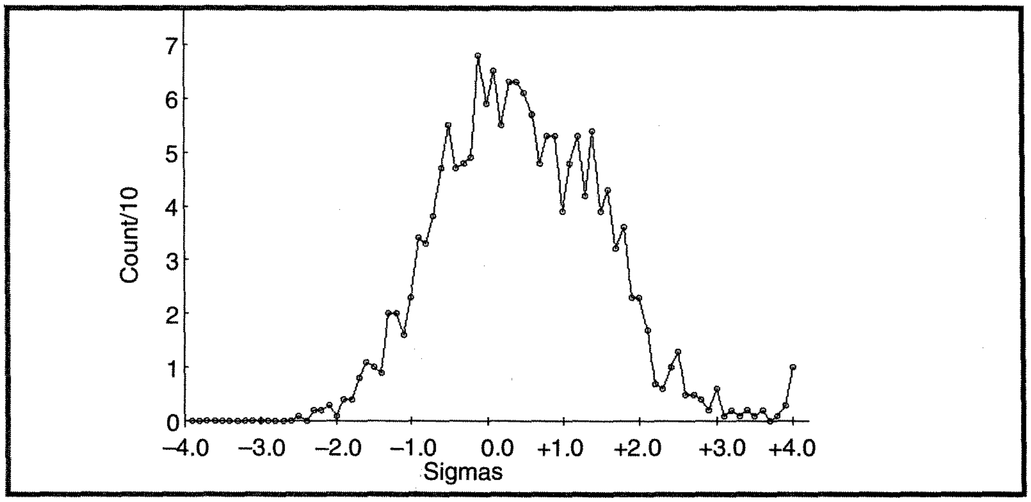


FIGURE 38-3.
Stock price distribution, IBM, 7-year.



dangerous naked puts and long stock on margin can be on days like this. No probability calculator is going to give much likelihood to a day like this occurring, but it *did* occur and it benefited those holding long puts greatly, while it seriously hurt others.

In addition to distributions for individual dates, distributions for individual stocks were created for the time period in question. The graph for IBM, using data from the same study as above (September 1993 to April 2000) is shown in Figure 38-3. In the next graph, Figure 38-4, a longer price history of IBM is used to draw the distribution: 1987 to 2000. Both graphs depict 30-day movements in IBM.

FIGURE 38-4.
Actual stock price distribution, IBM, 13-year.

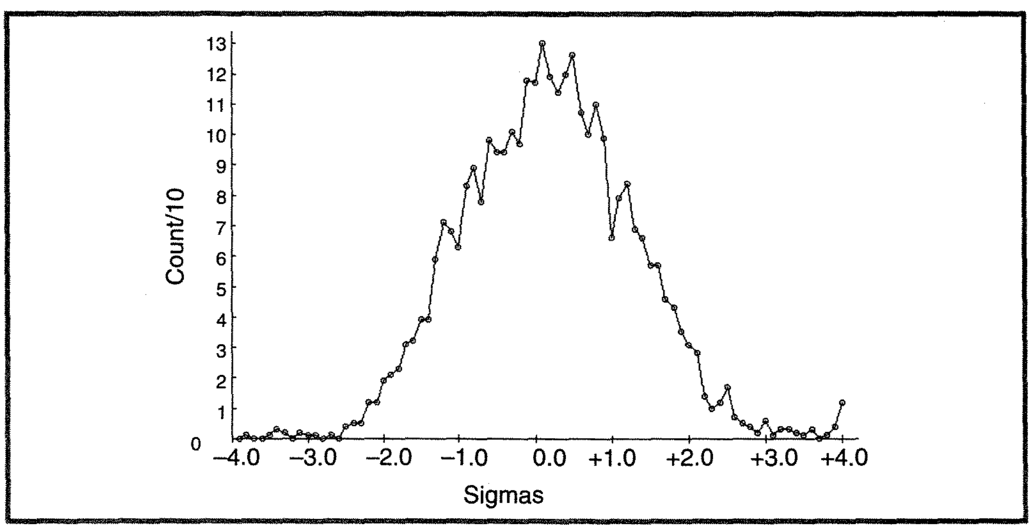


Figure 38-3 perhaps shows even more starkly how the bull market has affected things over the last six-plus years. There are over 1,600 data points for IBM (i.e., daily readings) in Figure 38-3, yet the whole distribution is skewed to the right. It apparently was able to move up quite easily throughout this time period. In fact, the worst move that occurred was *one* move of –2.5 standard deviations, while there were about *ten* moves of +4.0 standard deviations or more.

For a longer-term look at how IBM behaves, consider the longer-term distribution of IBM prices, going back to March 1987, as shown in Figure 38-4.

From Figure 38-4, it's clear that this longer-term distribution conforms more closely to the normal distribution in that it has a sort of symmetrical look, as opposed to Figure 38-3, which is clearly biased to the right (upside).

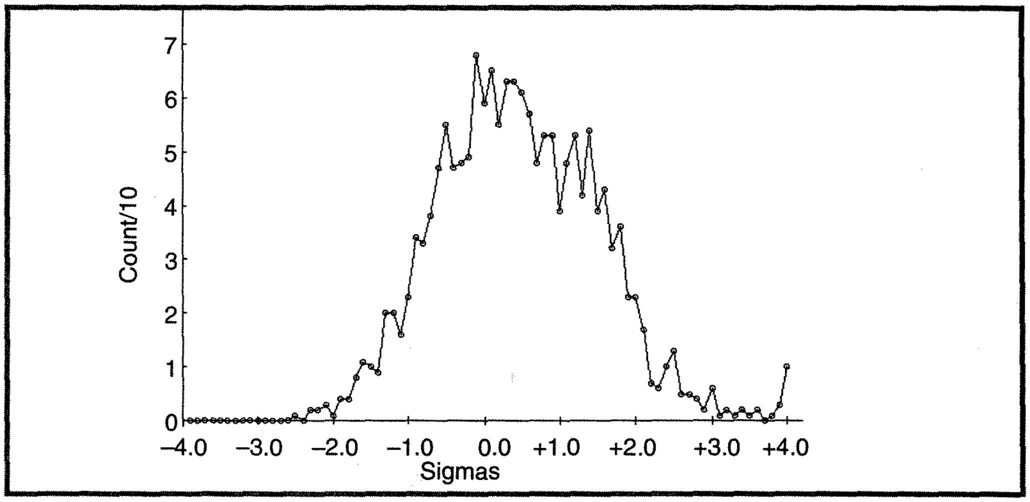
These two graphs have implications for the big picture study shown in Figure 38-1. The database used for this study had data for most stocks only going back to 1993 (IBM is one of the exceptions); but if the broad study of all stocks were run using data all the way back to 1987, it is certain that the "actual" price distribution would be more evenly centered, as opposed to its justification to the right (upside). That's because there would be more bearish periods in the longer study (1987, 1989, and 1990 all had some rather nasty periods). Still, this doesn't detract from the basic premise that stocks can move farther than the normal distribution would indicate.

WHAT THIS MEANS FOR OPTION TRADERS

The most obvious thing that an option trader can learn from these distributions and studies is that buying options is probably a lot more feasible than conventional wisdom would have you believe. The old thinking that selling an option is "best" because it wastes away every day is false. In reality, when you have sold an option, you are exposed to adverse price movements and adverse movements in implied volatility all during the life of the option. The likelihood of those occurring is great, and they generally have more influence on the price of the option in the short run than does time decay.

You might ask, "But doesn't all the volatility in 1999 and 2000 just distort the figures, making the big moves more likely than they ever were, and possibly ever will be again?" The answer to that is a resounding, "No!" The reason is that the *current* 20-day historical volatility was used on each day of the study in order to determine how many standard deviations each stock moved. So, in 1999 and 2000, that historical volatility was a high number and it therefore means that the stock would have had to move a very long way to move four standard deviations. In 1993, however, when the market was in the doldrums, historical volatility was low, and so a much smaller

FIGURE 38-3.
Stock price distribution, IBM, 7-year.



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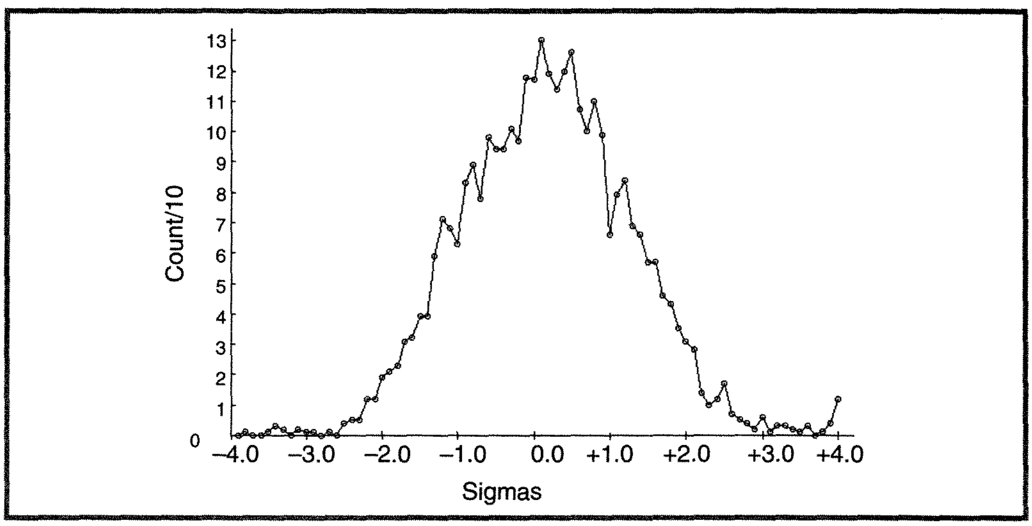

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You might ask, "But doesn't all the volatility in 1999 and 2000 just distort the figures, making the big moves more likely than they ever were, and possibly ever will be again?" The answer to that is a resounding, "No!" The reason is that the *current* 20-day historical volatility was used on each day of the study in order to determine how many standard deviations each stock moved. So, in 1999 and 2000, that historical volatility was a high number and it therefore means that the stock would have had to move a very long way to move four standard deviations. In 1993, however, when the market was in the doldrums, historical volatility was low, and so a much smaller

move was needed to register a 4-standard deviation move. To see a specific example of how this works in actual practice, look carefully at the chart of IBM in Figure 38-4, the one that encompasses the crash of '87. Don't you think it's a little strange that the chart doesn't show any moves of greater than minus 4.0 standard deviations? The reason is that IBM's historical volatility had already increased so much in the days preceding the crash day itself, that when IBM fell on the day of the crash, its move was *less* than minus 4.0 standard deviations. (Actually, its one-day move was greater than -4 standard deviations, but the 30-day move – which is what the graphs in Figure 38-3 and 38-4 depict – was not.)

STOCK PRICE DISTRIBUTION SUMMARY

One can say with a great deal of certainty that stocks do *not* conform to the normal distribution. Actually, the normal distribution is a decent approximation of stock price movement *most* of the time, but it's these "outlying" results that can hurt anyone using it as a basis for a nonvolatility strategy.

Scientists working on chaos theory have been trying to get a better handle on this. An article in *Scientific American* magazine ("A Fractal Walk Down Wall Street," February 1999 issue) met some criticism from followers of Elliot Wave theory, in that they claim the article's author is purporting to have "invented" things that R. N. Elliott discovered years ago. I don't know about that, but I do know that the article addresses these same points in more detail. In the article, the author points out that chaos theory was applied to the prediction of earthquakes. Essentially, it concluded that earthquakes can't be predicted. Is this therefore a useless analysis? No, says the author. It means that humans should concentrate on building stronger buildings that can withstand the earthquakes, for no one can predict when they may occur. Relating this to the option market, this means that one should concentrate on building strategies that can withstand the chaotic movements that occasionally occur, since chaotic stock price behavior can't be predicted either.

It is important that option traders, above all people, understand the risks of making too conservative an estimate of stock price movement. These risks are especially great for the writer of an option (and that includes covered writers and spreaders, who may be giving away too much upside by writing a call against long stock or long calls). By quantifying past stock price movements, as has been done in this chapter, my aim is to convince you that "conventional" assumptions are not good enough for your analyses. This doesn't mean that it's okay to buy overpriced options just because stocks can make large moves with a greater frequency than most option

models predict; but it certainly means that the buyer of underpriced options stands to benefit in a couple of ways. Conversely, an option seller must certainly concentrate his efforts where options are expensive, and even then should be acutely aware that he may experience larger-than-expected stock price movements while the option position is in place.

So what does this mean for option strategies? On the surface, it means that if one uses the normal (or lognormal) distribution for estimating the probability of a strategy's success, he *may* get a big move in the stock that he didn't originally view as possible. If one were long straddles, that's great. However, if he is short naked options, then there could be a nasty surprise in store. That's one reason why extreme caution should be used regarding selling naked options on stocks; they can make moves of this sort too often. At least with indices, such moves are far less frequent, although the Dow drop of over 550 points in October 1997 was a move of seven standard deviations, and the crash of '87 was about a 16-standard deviation move – which Professor Mark Rubenstein of the University of California at Berkeley says was something that should occur about once in *ten times the life of our current universe*! That's according to lognormal distribution, of course, which we know understates things somewhat, but it's still a big number under any distribution.

There are two approaches that one can take, then, regarding option strategies. One is to invent another method for estimating stock price distributions. Suffice it to say that that is not an easy task, or someone would have made it well-known already. There have been many attempts, including some in which a large history of stock price movements is observed and then a distribution is fitted to them. The problem with accounting for these occasional large price moves is that it is perhaps an even more grievous error to *overestimate* the probabilities of such moves than to underestimate them.

The second approach is to continue to use the normal distribution, because it's fast and accessible in a lot of places. Then, either rely on option buying strategies (straddles, for example) where implied volatility appears to be low – knowing that you have a chance at better results than the statistics might indicate – or adjust your calculations mentally for these large potential movements if you are using option selling strategies.

THE PRICING OF OPTIONS

The extreme movements of the fat tail distribution should be figured into the pricing of an option, but they really are not, at least not by most models. The Black–Scholes

model, for example, uses a lognormal distribution. Personally, this author believes that the Black–Scholes model is an excellent tool for analyzing options and option strategies, but one must understand that it may not be affording enough probability to large moves by the underlying.

Does this mean that most options are underpriced, since traders and market-makers are using the Black–Scholes model (or similar models) to price them? Without getting too technical, the answer is that yes, some options – particularly out-of-the-money options – are probably underpriced. However, one must understand that it is still a relatively rare occurrence to experience one of these big moves – it's just not as rare as the lognormal distribution would indicate. So, an out-of-the-money option might be *slightly* underpriced, but often not enough to make any real difference.

In fact, *futures* options in grains, gold, oil, and other markets that often experience large and sudden rallies display a distinct volatility skew. That is, out-of-the-money *call* options trade at significantly higher implied volatilities than do at-the-money options. Ironically, there is far less chance of one of these hyper-standard-deviation moves occurring in commodities than there is in stocks, at least if history is a guide. So, the fact that some out-of-the-money futures options are expensive is probably an incorrect *over*adjustment for the possibility of large moves.

THE PROBABILITY OF STOCK PRICE MOVEMENT

The distribution information introduced in this chapter can be incorporated into somewhat rigorous methods of determining probabilities. That is, one can attempt to assess the chances of a stock, futures contract, or index moving by a given distance, and those chances can incorporate the fat tails or other *non*-lognormal behavior of prices.

The software that calculates such probabilities is typically named a "probability calculator." There are many such software programs available in the marketplace. They range from free calculators to completely overpriced ones selling for more than $1,000. In reality, high-level probability calculation software can be created by someone with a good understanding of statistics, or a program can be purchased for a rather nominal fee – perhaps $100 or so.

Before getting into these various methods of probability estimation, it should be noted that all of them require the trader to input a volatility estimate. There are only a few other inputs, usually the stock price, target price(s), and length of time of the study. The volatility one inputs is, of course, an estimate of *future* volatility – some-

thing that cannot be predicted with certainty. Nevertheless, any probability calculator requires this input. So, one must understand that the results one obtains from any of these probability calculators is an estimate of what might happen. It should not be relied on as "gospel."

Additionally, probability calculators make a second assumption: that the volatility one inputs will remain constant over the entire length of the study. We *know* this is incorrect, for volatility can change daily. However, there really isn't a good way of estimating how volatility might change in the course of the study, so we are pretty much forced to live with this incorrect assumption as well.

There is no certain way to mitigate these volatility "problems" as far as the probability calculator is concerned, but one helpful technique is to bias the volatility projection *against* your objectives. That is, be overly conservative in your volatility projections. If things turn out to be better than you estimated, fine. However, at least you won't be overstating things initially. An example may help to demonstrate this technique.

Example: Suppose that a trader is considering buying a straddle on XYZ. The five-month straddle is selling for a price of 8, with the stock currently trading near 40. A probability calculator will help him to determine the chances that XYZ can rise to 48 or fall to 32 (the break-even points) prior to the options' expiration. However, the probability calculator's answer will depend heavily on the volatility estimate that the trader plugs into the probability calculator. Suppose that the following information is know about the historical volatility of XYZ:

10-day historical volatility:	22%
20-day historical volatility:	20%
50-day historical volatility:	28%
100-day historical volatility	33%

Which volatility should the trader use? Should he choose the 100-day historical volatility since this is a five-month straddle, which encompasses just about 100 trading days until expiration? Should he use the 20-day historical volatility, since that is the "generally accepted" measure that most traders refer to? Should he calculate a historical volatility based *exactly* on the number of days until expiration and use that?

To be most conservative, *none* of those answers is right, at least not for the right reasons. Since one is buying options in this strategy, he should use the *lowest* of the above historical volatility measures as his volatility estimate. By doing so, he is taking a conservative approach. If the straddle buy looks good under this conservative assumption, then he can feel fairly certain that he has not overstated the possibilities

of success. If it turns out that volatility is *higher* during the life of the position, that will be an added benefit to this position consisting of long options. So, in this example, he should use the 20-day historical volatility *because it is the lowest of the four choices that he has.*

Similarly, if one is considering the sale of options or is taking a position with a negative vega (one that will be harmed if volatility increases), then he should use the *highest* historical volatility when making his probability projections. By so doing, he is again being conservative. If the strategy in question still looks good, even under an assumption of high volatility, then he can figure that he won't be unpleasantly surprised by a higher volatility during the life of the position.

There have been times when a 100-day lookback period was not sufficient for determining historical volatility. That is, the underlying has been performing in an erratic or unusual manner for over 100 days. In reality, its true nature is not described by its movements over the past 100 days. Some might say that 100 days is not enough time to determine the historical volatility in any case, although most of the time the four volatility measures shown above will be a sufficient guide for volatility.

When a longer lookback period is required, there is another method that can be used: Go back in a historical database of prices for the underlying and compute the 20-day, 50-day, and 100-day historic volatilities for *all* the time periods in the database, or at least during a fairly large segment of the past prices. Then use the *median* of those calculations for your volatility estimates.

Example: XYZ has been behaving erratically for several months, due to overall market volatility being high as well as to a series of chaotic news events that have been affecting XYZ. A trader wants to trade XYZ's options, but needs a good estimate of the "true" volatility potential of XYZ, for he thinks that the news events are out of the way now. At the current time, the historical volatility readings are:

20-day historical:	130%
50-day historical	100%
100-day historical	80%

However, when the trader looks farther back in XYZ's trading history, he sees that it is not normally this volatile. Since he suspects that XYZ's recent trading history is not typical of its true long-term performance, what volatility should he use in either an option model or a probability calculator?

Rather than just using the maximum or minimum of the above three numbers (depending on whether one is buying or selling options), the trader decides to look

back over the last 1,000 trading days for XYZ. A 100-day historical volatility can be computed, using 100 consecutive trading days of data, for 901 of those days (beginning with the 100th day and continuing through the 1,000th day, which is presumably the current trading day). Admittedly, these are not completely unique time periods; there would only be ten non-overlapping (independent) consecutive 100-day periods in 1,000 days of data. However, let's assume that the 901 periods are used. One can then arrive at a *distribution* of 100-day historical volatilities. Suppose it looks something like this:

Percentile	100-Day Historical
0^{th}	34%
10^{th}	37%
20^{th}	43%
30^{th}	45%
40^{th}	46%
50^{th}	48%
60^{th}	51%
70^{th}	58%
80^{th}	67%
90^{th}	75%
100^{th}	81%

In other words, the 901 historical volatilities (100 days in each) are sorted and then the percentiles are determined. The above table is just a snapshot of where the percentiles lie. The range of those 901 volatilities is from 34% on the low side to 81% on the high side. Notice also that there is a very flat grouping from about the 20th percentile to the 60th percentile: The 100-day historical volatility was between 43% and 51% over that entire range. The *median* of the above figures is 48% – the 100-day volatility at the 50th percentile.

Referring to the early part of this example, the current 100-day historical is 80%, a very high reading in comparison to what the measures were over the past 1,000 days, and certainly much higher than the median of 48%.

One could perform similar analyses on the 1,000 days of historical data to determine where the 10-day, 20-day, and 50-day historical volatilities were over that time. Those, too, could be sorted and arranged in percentile format, using the 50% percentile (median) as a good estimate of volatility. After such computations, the trader might then have this information:

Using 1,000 days of data:

Median 100-day historical volatility: 48%
Median 50-day historical volatility: 49%
Median 20-day historical volatility: 52%
Median 10-day historical volatility: 49%

If these were all the data that one had, then he would probably use a volatility estimate of 48% or so in his option models or probability calculators. Of course, this is starkly different from the current levels of historical volatility (shown at the beginning of this example). So, one must be careful in assessing whether he expects the stock to perform more in line with its longer-term (1,000 trading days) characteristics or if there is some reason to think that the stock's behavior patterns have changed and the higher, more recent volatilities should be used.

The pertinent volatilities to consider, then, in a strategy analysis are the medians as well as the current figures. If the trader were going to be buying options in his strategy, should he use the minimum of the volatilities shown, 48%? Probably. However, if he's a seller of options, should he use the maximum, 130%? That might be a little *too* much of a penalty, but at least he would feel safe that if his volatility selling position had a positive expected return with that high a volatility projection, then it must truly be an attractive position.

In an analysis like that shown in this example, there is nothing magical about using 1,000 trading days. Perhaps something like 600 trading days would be better. The idea is to use enough trading days to bring in some historic data to counterbalance the recent, erratic behavior of the stock.

Among other things, this example also shows that volatilities are unstable, no matter how much work and mathematics one puts into calculating them. Therefore, they are at best a fragile estimate of what might happen in the future. Still, it's the best guess that one can make. The trader should realize, though, that when volatilities are this disparate when comparing recent and more distant activity, the results of any mathematical projections using those volatilities should not be relied upon too heavily. Those results will be just as tenuous as the volatility projections themselves.

Of course, in any case, the actual volatility that occurs while the position is in place may be even more unfavorable than the one the trader used in his initial analysis. There is nothing that one can do about that. But if you choose what appears to be a somewhat unfavorable volatility, and the position still looks good under those assumptions, then it is likely that the trader will be pleasantly surprised more often than not – that actual volatility during the life of the position will tend to be more in his favor than not.

In a recent chapter, the various methods of trying to predict volatility were outlined, using either historical volatility, implied volatility, a moving average of either of those, or even GARCH volatility. None of these will predict with certainty what is going to happen in the future. Hence, the prediction of volatility is necessarily vague at best.

In addition to the vagaries of estimating volatility, the probability calculators will return an answer that represents the probability of something happening "in the long run." That is, if the same scenario were to arise many, many times, the answer is relevant to how many times the stock would move to the indicated target price. This is small solace if one happens to be caught in the vortex of the Crash of '87, for example. So, just remember that these probability calculators are tools that can help you in assessing the relative risks of similar positions (evaluating various naked option sales, say), but the resulting stock movement in any one case can be quite different from what any probability calculator describes as the chances of that move actually happening.

THE ENDPOINT CALCULATION

The following paragraphs describe how the various probability calculation mechanisms work. The simplest and most straightforward probability calculation has already been presented in Chapter 28 on mathematical applications. It was included in the section on "expected returns" in that chapter. The formula is presented here again, for completeness.

The formula gives the probability of a stock, which is currently at price p, being below some other price, q, at the end of the time period. The lognormal distribution is assumed.

Probability of stock being below price q at end of time period, t

$$P\text{ (below)} = \mathrm{N}\left(\frac{\ln\left(\frac{q}{p}\right)}{v_t}\right)$$

where

N = cumulative normal distribution

p = current price of the stock

q = price in question

ln = natural logarithm for the time period in question

If one is interested in computing the probability of the stock being above the given price, the formula is

$$P\ (\text{above}) = 1 - P\ (\text{below})$$

In the above formula, $v_t = v\sqrt{t}$ where t is time to expiration in years and v is annual volatility, as usual.

This formula is quite elementary for predictive purposes, and it is used by many traders. This calculator can be found for free at the Web site www.optionstrategist.com. Its main problem is that it gives the probability of the stock being above or below the target price *at the end of the time period, t.* That's not a totally realistic way of approaching probability analysis. Most option traders are very concerned with what happens to their positions *during* the life of the option, not just at expiration.

Example: suppose a trader is a seller of naked put options. He sells \$OEX October 550 puts naked, with \$OEX currently trading at 600. He would not normally just walk away from this position until October expiration, because of the large risk involved with the sale of a naked option. There are essentially three scenarios that can occur:

1. \$OEX might *never* fall to 550 by expiration. In this case, he would have a very comfortable trade that was never in jeopardy, and the options would expire worthless.
2. \$OEX might fall below 550 and remain there until expiration. In this case, he would surely have a loss unless \$OEX were just a tiny bit below 550.
3. \$OEX might fall below 550 at some time between when the trade was established and when expiration occurred, but then subsequently rally back above 550 by the time expiration arrived.

An experienced option trader would almost certainly adjust if scenario 3 arose, in order to prevent large losses from occurring. He might roll his naked puts down and out to another strike, or he might just close them out altogether. However, it is unlikely that he would do *nothing.*

The simple probability calculator formula shown above does *not* take into account the trader's third scenario. Since it is only concerned with where the stock is at expiration of the options, only scenarios 1 and 2 apply to it. Hence the usage of this simple calculator is not really descriptive of what might happen to a trade *during* its lifetime.

Let's assign some numbers to the above trade, so that you might see the difference. Suppose that the volatility estimate is 25%, there are 30 days until expiration, and the prices are as stated in the previous example: \$OEX is at 600, and the strik-

ing price of the naked put being sold is 550. The resulting probabilities might be something like this:

Scenario	Actual Probability of Occurrence
1. $OEX never falls below 550	67%
2. $OEX falls below 550 and remains there	19%
3. $OEX falls below 550 but rallies later	14%

The probabilities stated above are the "real" probabilities of the three various scenarios occurring. However, if one were using the simple probability calculator presented above, he would only have the following information:

Probability of $OEX being above 550 at expiration: 81%
Probability of $OEX being below 550 at expiration: 19%

So, with the simple calculator, it looks like there's an 81% chance of a worry-free trade. Just sit back and relax and let the option expire worthless. However, in real life – as shown by the previous set of probabilities, there's only a 67% chance of a worry-free trade. The difference – the other 14% – is the probability of the third scenario occurring ($OEX falls below 550, but rallies back above it by expiration). The simple probability calculator doesn't account for that scenario at all.

Hence, most serious traders don't use the simple model. Does that mean it's not useful at all? No, it is certainly viable as a comparative tool; for example, to compare the chances of the $OEX put expiring worthless versus those of another put sale being considered, perhaps something in a stock option. However, better analyses can be undertaken.

Before leaving the scenario of the simple probability calculator, one more point should be made. It has been mentioned earlier in this book that the delta of an option is actually a fairly good estimate of the probability of the option being in-the-money at its expiration date. Thus, the delta and the simple endpoint probability calculator shown above attempt to convey the same information to a trader. In reality, because of the fact that implied volatility might be different for various strikes (a volatility skew), especially in index options, the delta of the option might not agree exactly with the probability calculator. Even so, the delta is a quick and dirty way of estimating the probability of the stock being above the strike price (in the case of call options) or below the strike price (in the case of put options) at expiration.

THE "EVER" CALCULATOR

Having seen the frailties of the endpoint calculator, the next step is to try to design a calculator that can estimate the probability of the stock *ever* hitting the target price(s)

at any time during the life of the probability study, usually the life of an option. It turns out that there are a couple of ways to approach this problem. One is with a Monte Carlo analysis, whereby one lets a computer run a large number of randomly-generated scenarios (say, 100,000 or so) and counts the number of times the target price is hit. A Monte Carlo analysis is a completely valid way of estimating the probability of an event, but it is a somewhat complicated approach.

In reality, there is a way to create a single formula that can estimate the "ever" probability, although it is not any easy task either. In the following discussion, I am borrowing liberally from correspondence with Dr. Stewart Mayhew, Professor of Mathematics at the University of Georgia. For proprietary reasons, the exact formula is not given here, but the following description should be sufficient for a mathematics or statistics major to encode it. If one is not interested in implementing the actual formula, the calculation can be obtained through programs sold by McMillan Analysis Corp. at www.optionstrategist.com.

This discussion is quite technical, so readers not interested in the description of the mathematics can skip the next paragraph and instead move ahead to the next section on Monte Carlo studies.

These are the steps necessary in determining the formula for the "ever" probability of a stock hitting an upside target at any time during its life. First, make the assumption that stock prices behave randomly, and perform at the risk-free rate, r. Mathematicians call random behavior "Brownian motion." There are a number of formulae available in statistics books regarding Brownian motion. If one is to estimate the probability of reaching a maximum (upside target) point, what is needed is the known formula for the *cumulative density function (CDF)* for a running maximum of a Brownian motion. In that formula, it is necessary to use the lognormal function to describe the upside target. Thus, instead of using the actual target price in the CDF formula, one substitutes $ln(q/p)$, where q is the target price and p is the current stock price.

The "ever" probability calculator provides much more useful information to a trader of options. Not only does a naked option seller have a much more realistic estimate of the probability that he's going to have to make an adjustment during the life of an option, but the option buyer can find the information useful as well. For example, if one is buying an option at a price of 10, say, then he could use the "ever" probability calculator to estimate the chances of the stock trading 10 points above the striking price at any time during the life of the option. That is, what are the chances that the option is going to at least break even? The option buyer can, of course, determine other things too, such as the probability that the option doubles in price (or reaches some other return on investment, such as he might deem appropriate for his analysis).

THE MONTE CARLO PROBABILITY CALCULATOR

Up to this point, the calculators we have discussed are subject to the limitations described earlier – mainly, that they rely heavily on one's volatility estimate, that they assume the volatility will remain constant over time, and that they assume a lognormal distribution. The early part of this chapter was spent explaining that the lognormal distribution is *not* the real distribution that stock prices adhere to. So, what we'd like to see in a probability calculator is one that could adjust for various volatility scenarios as time passed and one in which the assumed distribution of stock prices was *not* lognormal.

When one starts to make these sorts of assumptions, I do not believe there is a single formula that can be derived for the probability calculations. Rather, what is known as a Monte Carlo simulation must be undertaken. Essentially, one "tells" the computer what he is trying to simulate. It could be any number of things in real life, perhaps the rocket engine components in a NASA space shuttle, or the operation of an internal combustion engine, or the movement of a stock. As long as the process can be described, it can be simulated by a computer. Then, the computer can run a large number of those simulations to determine the answers to such things as "What is the failure rate of the NASA engine components," or "How long can the internal combustion engine go without an oil change," or "What is the probability of the stock trading at a certain target price?" The Monte Carlo simulation technique can be thought of as letting the computer run through the simulation a *lot* of times and counting how many times a certain outcome occurs. If the number of trials (simulations) is large enough and the model is good enough, then the resulting count divided by the number of trials undertaken is a good probability estimate of the said event occurring. The reason one runs a lot of trials is that over a large number of trials, the frequency with which an event occurs will approximate the actual probability of its occurrence for a single trial – the single trial being your trade, for example.

The next three paragraphs describe the general process necessary for constructing a stock probability calculator using a Monte Carlo simulation. Again, this is fairly technical, so if the reader is not interested in the background behind the mathematics, then skip ahead three paragraphs. In the case of a stock probability calculator, the Monte Carlo simulation can be undertaken as follows.

We know what the distribution of stock prices looks like. The fat tails can be built into the distribution if one wants to simulate real life. See Figure 38-1 for both the lognormal distribution and the actual distribution. It's a simple matter to tell the computer this information. For example, recall that 2.5 million points went into making up Figure 38-1. In the actual distribution in Figure 38-1, about 92,000 (or 3.68%)

of them resulted in the stock being unchanged. Also, only about 2,500 or them, or 1/10th of one percent, resulted in a move of –4.0 standard deviations or more. Those percentages, along with all of the others, would be built into the computer, so that the total distribution accounts for 100% of all possible stock movements.

Then, we tell the computer to allow a stock to move randomly in accordance with whatever volatility the user has input. So, there would be a fairly large probability that it wouldn't move very far on a given day, and a very small probability that it would move three or more standard deviations. Of course, with the fat tail distribution, there would be a larger probability of a movement of three or more standard deviations than there would be with the regular lognormal distribution. The Monte Carlo simulation progresses through the given number of trading days, moving the stock cumulatively as time passes. If the stock hits the break-even price, that particular simulation can be terminated and the next one begun. At the end of all the trials (100,000 perhaps), the number in which the upside target was touched is divided by the total number of trials to give the probability estimate.

Is it really worth all this extra trouble to evaluate these more complicated probability distributions? It seems so. Consider the following example:

Example: Suppose that a trader is considering selling naked puts on XYZ stock, which is currently trading at a price of 80. He wants to sell the November 60 puts, which expire in two months. Although XYZ is a fairly volatile stock, he feels that he wouldn't mind owning it if it were put to him. However, he would like to see the puts expire worthless. Suppose the following information is available to him via the various probability calculators:

Simple "end point" probability of XYZ < 60 at expiration:	10%
Probability that XYZ *ever* trades < 60 (using the lognormal distribution)	20%
Probability that XYZ *ever* trades < 60 (using the fat tail distribution):	22%

If the chances of the put never needing attention were truly only 10%, this trader would probably sell the puts naked and feel quite comfortable that he had a trade that he wouldn't have to worry too much about later on. However, if the *true* probability that the put will need attention is 22%, then he might *not* take the trade. Many naked option sellers try to sell options that have only probabilities of 15% or less of potentially becoming troublesome.

Hence, the choice of which probability calculation he uses can make a difference in whether or not a trade is established.

Other strategies lend themselves quite well to probability analysis as well. Credit spreaders – sellers of out-of-the-money put spreads – usually attempt to quantify the probability of having to take defensive action. Any action to adjust or remove

a deeply out-of-the-money put credit spread usually destroys most or all of its profitability, so an accurate initial assessment of the probabilities of having to make such an adjustment is important.

Option buyers, too, would benefit from the use of a more accurate probability estimate. This is especially true for neutral strategies, such as straddle or strangle buying, when the trader is interested in the chances of the stock being able to move far enough to hit one or the other of the straddle's break-even points at *some* time during the life of the straddle.

The Monte Carlo probability calculation can be expanded to include other sorts of distributions. In the world of statistics, there are many distributions that define random patterns. The lognormal distribution is but one of them (although it is the one that most closely follows stock prices movements in general). Also, there is a school of thought that says that each stock's individual price distribution patterns should be analyzed when looking at strategies on that stock, as opposed to using a general stock price distribution accumulated over the entire market. There is much debate about that, because an individual stock's trading pattern can change abruptly just consider any of the Internet stocks in the late 1990s and early 2000s. Thus, a probability estimate based on a single stock's behavior, even if that behavior extends back several years, might be too unreliable a statistic upon which to base a probability estimate.

In summary, then, one *should* use a probability calculator before taking an option position, even an outright option buy. Perhaps straight stock traders should use a probability calcutor as well. In doing so, though, one should be aware of the limitations of the estimate: It is heavily biased by the volatility estimate that is input and by the assumption of what distribution the underlying instrument will adhere to during the life of the position. While neither of those limitations can be overcome completely, one can mitigate the problems by using a conservative volatility estimate. Also, he can look at the results of the probability calculation under several distributions (perhaps lognormal, fat tail, and the distribution using only the past price behavior of the underlying instrument in question) and see how they differ. In that case, he would at least have a feeling for what *could* happen during the life of the option position.

EXPECTED RETURN

The concept of expected return was described in the chapter on mathematical applications. In short, expected return is a position's expected profit divided by its investment (or *expected* investment if the investment varies with stock price, as in a naked option position or a futures position). The crucial component, though, is expected profit.

Expected profit is computed by calculating the profitability of a position at a certain stock price times the *probability* of the stock *being* at that price, and summing that multiple over all possible stock prices. When the concept was first introduced, the "probability of the stock being at that price" was given as what we now know is the "endpoint" probability. In reality, a much better measure of the expected profit of a position can be obtained by using one of the more advanced probability estimation models presented above.

In generalized expected return studies done using the fat tails Monte Carlo simulation, certain general conclusions can be drawn about some strategies.

- A bull spread is an inferior strategy when the options are fairly priced, no matter which distribution is assumed. This more or less agrees with observations that have been made previously regarding the disappointments that traders often encounter when using vertical spreads.
- While covered writing might seem superior to stock ownership under the lognormal distribution, the two are about equal under a fat tail distribution.
- Most startling, though, is the fact that option buying strategies fare much, much better under a fat tail distribution than a lognormal one. This most clearly demonstrates the "power" of the fat tail distribution: A limited-risk investment with unlimited profit potential can be expected to perform very well if the fat tails are allowed for.

Using the lognormal distribution more or less represents the conventional wisdom regarding option strategies – the one that many brokers promote: "Don't buy options, don't mess with spreads, either buy stocks or do covered call writes." The fat tail distribution column stands much of that advice on its head. In real life (as demonstrated by the fat tail distribution), strategies with limited profit potential and unlimited or large risk potential are inferior strategies.

One should be aware that the phrase "expected return" is used in many quasi-sophisticated option analyses (and even in analyses not using options). Many investors accept these "returns" on blind faith, figuring that if they're generated by a computer, they must be correct. In reality, they may be not be representative, even for comparisons.

SUMMARY

This chapter has demonstrated that probability analysis is an *inexact* science, because markets behave in ways that are very difficult to describe mathematically. However, probability analysis is also *necessary* for the option strategist; without it he would be

in the dark as to the likelihood of profitable outcomes for his strategy. Overall, in a diversified set of positions, the option strategist should use the fat tail distribution in a Monte Carlo simulation to estimate probabilities. However, if that is not available, he can use the normal or lognormal distribution with the proviso that he understands it is not "gospel." He should require very stringent criteria on any strategies that are antivolatility strategies, such as naked option writing of stock options, for there is a greater than normal chance of a large move by the underlying, especially if the underlying is stock.

The sophisticated trader may want to view his probabilities in the light of more than one proposed distribution of prices. Of course, this type of analysis (using several distributions) puts the onus on the investor to choose the distribution that he wants to use in order to analyze his investment. However, such an approach should be extremely illustrative in that he can compare returns from different strategies and have a reasonable expectation as to which ones might perform the best under different market conditions.

CHAPTER 39

Volatility Trading Techniques

The previous three chapters laid the foundation for volatility trading. In this chapter, the actual application of the technique will be described. It should be understood that volatility trading is both an art and a science. It's a science to the extent that one must be rigorous about determining historical volatility or implied volatility, calculating probabilities, and so forth. However, given the vagaries of those measurements that were described in some detail in the previous chapters, volatility trading is also something of an art. Just as two fundamental analysts with the same information regarding earnings, sales projection, and so on might have two different opinions about a stock's fortunes, so also can two volatility traders disagree about the potential for movement in a stock.

However, volatility traders do agree on the approach. *It is based on comparing today's implied volatility with what one expects volatility to do in the future.* As noted previously, one's expectations for volatility might be based on volatility charts, patterns of historical volatility and implied volatility, or something as complicated as a GARCH forecasting model. None of them guarantees success. However, we *do* know that volatility tends to trade in a range in the long run. Therefore, the approach that traders agree upon is this: If implied volatility is "low," buy it. If it's "high," sell it with caution. So simple: Buy low, sell high (not necessarily in that order). The theory behind volatility trading is that it's *easier* to buy low and sell high (or at least to determine what's "low" and "high") when one is speaking about volatility, than it is to do the same thing when one is talking about stock prices.

Most of the time, implied volatility will not be significantly high or low on any particular stock, futures contract, or index. Therefore, the volatility trader will have little interest in most stocks on any given day. This is especially true of the big-cap stocks, the ones whose options are most heavily traded. There are so many traders

watching the situation for those stocks that they will rarely let volatility get to the extremes that one would consider "too high" or "too low." Yet, with the large number of optionable stocks, futures, and indices that exist, there are always *some* that are out of line, and that's where the independent volatility trader will concentrate his efforts.

Once a volatility extreme has been uncovered, there are different methods of trading it. Some traders – market-makers and short-term traders – are just looking for very fleeting trades, and expect volatility to fall back into line quickly after an aberrant move. Others prefer more of a position traders' approach: attempting to determine volatility extremes that are so far out of line with accepted norms that it will probably take some time to move back into line. Obviously, the trader's own situation will dictate, to a certain extent, which strategy he pursues. Things such as commission rates, capital requirements, and risk tolerance will determine whether one is more of a short-term trader or a position trader. The techniques to be described in this chapter apply to both methods, although the emphasis will be on position trading.

TWO WAYS VOLATILITY PREDICTIONS CAN BE WRONG

When traders determine the implied volatility of the options on any particular underlying instrument, they may generally be correct in their predictions; that is, implied volatility will actually be a fairly good estimate of forthcoming volatility. However, when they're *wrong,* they can actually be wrong in two ways: either in the outright prediction of volatility or in the *path* of their volatility predictions. Let's discuss both. When they're wrong about the absolute level of volatility, that merely means that implied volatility is either "too low" or "too high." In retrospect, one could only make that assessment, of course, after having seen what actual volatility turned out to be over the life of the option. The second way they could be wrong is by making the implied volatility on *some* of the options on a particular underlying instrument much cheaper or more expensive than other options on that same underlying instrument. This is called a *volatility skew* and it is usually an incorrect prediction about the way the underlying will perform during the life of the options.

The rest of this chapter will be divided into two main parts, then. The first part will deal with volatility from the viewpoint of the absolute level of implied volatility being "wrong" (which we'll call "trading the volatility prediction"), and the second part will deal with trading the volatility skew.

TRADING THE VOLATILITY PREDICTION

The volatility trader must have some way of determining when implied volatility is sufficiently out of line that it warrants a trade. Then he must decide what trade to establish. Furthermore, as with any strategy – especially option strategies – follow-up action is important too. We will not be introducing any new strategies, per se, in this chapter. Those strategies have already been laid out in the previous chapters of this book. However, we will briefly review important points about those strategies and their follow-up actions where it is appropriate.

First, one must try to find situations in which implied volatility is out of line. That is not the end of the analysis, though. After that, one needs to do some probability work and needs to see how the underlying has behaved in the past. Other fine-tuning measures are often useful, too. These will all be described in this chapter.

DETERMINING WHEN VOLATILITY IS OUT OF LINE

There is much disagreement among volatility traders regarding the best method to use for determining if implied volatility is "out of line." Most favor comparing implied with historical volatility. However, it was shown two chapters ago that implied volatility is not necessarily a good predictor of historical volatility. Yet this approach cannot be discarded; however it must be used judiciously. Another approach is to compare today's implied volatility with where it has been in the past. This concept relies heavily on the concept of the *percentile* of implied volatility. Finally, there is the approach of trying to "read" the charts of implied and historical volatility. This is actually something akin to what GARCH tries to do, but on a short-term horizon. So the approaches are:

1. Compare implied volatility to its own past levels (percentile approach).
2. Compare implied volatility to historical volatility.
3. Interpret the chart of volatility.

In addition, we will examine two lesser-used methods: comparing current levels of historical volatility to past measures of historical volatility, and finally, using only a probability calculator and trading the situation that has the best probabilities of success.

THE PERCENTILE APPROACH

In this author's opinion, there is much merit in the percentile approach. When one says that volatility tends to trade in a range, which is the basic premise behind volatility trad-

ing, he is generally talking about implied volatility. Thus, it makes sense to know where implied volatility *is* within the range of the past readings of implied volatility. If volatility is low with respect to where it usually trades, then we can say the options are cheap. Conversely, if it's high with respect to those past values, then we can say the options are expensive. These conclusions do not draw on historical volatility.

The *percentile* of implied volatility is generally used to describe just where the current implied volatility reading lies with respect to its past values. The "implied volatility" reading that is being used in this case is the *composite* reading – the one that takes into account all the options on an underlying instrument, weighting them by their distance in- or out-of-the-money (at-the-money gets more weight) and also weighting them by their trading volume. This technique has been referred to many times and was first described in Chapter 28 on mathematical applications. That composite implied volatility reading can be stored in a database for each underlying instrument every day. Such databases are available for purchase from firms that specialize in option data. Also, snapshots of such data are available to members of www.optionstrategist.com.

In general, most underlying instruments would have a composite implied volatility reading somewhere near the 50th percentile on any given day. However, it is not uncommon to see *some* underlyings with percentile readings near zero or 100% on a given day. These are the ones that would interest a volatility trader. Those with readings in the 10th percentile or less, say, would be considered "cheap"; those in the 90th percentile or higher would be considered expensive.

In reality, the percentile of implied volatility is going to be affected by what the broad market is doing. For example, during a severe market slide, implied volatilities will increase across the board. Then, one may find a large number of stocks whose options are in the 90th percentile or higher. Conversely, there have been other times when overall implied volatility has declined substantially: 1993, for example, and the summer of 2001, for another. At those times, we often find a great number of stocks whose options reside in the 10th percentile of implied volatility or lower. The point is that the distribution of percentile readings is a dynamic thing, not something static like a lognormal distribution. Yes, perhaps over a long period of time and taking into account a great number of cases, we might find that the percentiles of implied volatility are normally distributed, but not on any given day.

The trader has some discretion over this percentile calculation. Foremost, he must decide how many days of past history he wants to use in determining the percentiles. There are about 255 trading days in a year. So, if he wanted a two-year history, he would record the percentile of today's composite implied volatility with respect to the 510 daily readings over the past two years. This author typically uses

600 days of implied volatility history for the purpose of determining percentiles, but a case could be made for other lengths of time. The purpose is to use enough implied volatility history to give one a good perspective. Then, a reading of the 10th percentile or the 90th percentile will truly be significant and would therefore be a good starting point in determining whether the options are cheap or expensive.

In addition to the actual percentile, the trader should also be aware of the *width* of the implied volatility distribution. This was discussed in an earlier chapter, but essentially the concept is this: If the first percentile is an implied volatility of 40% and the 100th percentile is an implied volatility of 45%, then that entire range is so narrow as to be meaningless in terms of whether one could classify the options as cheap or expensive.

The advantage of buying options in a low percentile of implied volatility is to give oneself two ways to make money: one, via movement in the underlying (if a straddle were owned, for example), and two, by an increase in implied volatility. That is, if the options were to return to the 50th percentile of implied volatility, the volatility trader who has bought "cheap" options should expect to make money from that movement as well. That can only happen if the 50th percentile and the 10th percentile are sufficiently far apart to allow for an increase in the price of the option to be meaningful. Perhaps a good rule of thumb is this: *If the option rises from the current (low) percentile reading to the* 50th *percentile in a month, will the increase in implied volatility be equal to or greater than the time decay over that period?* Alternatively stated, with all other things being equal, will the option be trading at the same or a greater price in a month, if implied volatility rises to the 50th percentile at the end of that time? If so, then the width of the range of implied volatilities is great enough to produce the desired results.

The attractiveness to this method for determining if implied volatility is out of line is that the trader is "forced" to buy options that are cheap (or to sell options that are expensive), on a relative basis. Even though historical volatility has not been taken into consideration, it will be later on when the probability calculators are brought to bear. There is no guarantee, of course, that implied volatility will move toward the 50th percentile while the position is in place, but if it does, that will certainly be an aid to the position.

In effect this method is measuring what the option trading public is "thinking" about volatility and comparing it with what they've thought in the past. Since the public is wrong (about prices as well as volatility) at major turning points, it is valid to want to be long volatility when "everyone else" has pushed it down to depressed levels. The converse may not necessarily be true: that we would want to be short volatility when everyone else has pushed it up to extremely high levels. The caveat in that case is that

someone may have inside information that justifies expensive options. This is another reason why selling volatility can be difficult: You may be dealing with far less information than those who are actually *making* the implied volatility high.

COMPARING IMPLIED AND HISTORICAL VOLATILITY

The most common way that traders determine which options are cheap or expensive is by comparing the current composite implied volatility with various historical volatility measures. However, just because this is the conventional wisdom does not necessarily mean that this method is the preferred one for determining which options are best for volatility trades. In this author's opinion, it is inferior to the percentile method (comparing implied to past measures of implied), but it does have its merits. The theory behind using this method is that it is a virtual certainty that implied and historical volatility will *eventually* converge with each other. So, if one establishes volatility trading positions when they are far apart, there is supposedly an advantage there.

However, this argument has plenty of holes in it. First of all, there is no guarantee that the two will converge in a timely manner, for example, before the options in the trader's position can become profitable. Historical and implied volatility often remain fairly far apart for weeks at a time.

Second, even if the convergence does occur, it doesn't necessarily mean one will make money. As an example, consider the case in which implied volatility is 40% and historical volatility is 60%. That's quite a difference, so you'd want to buy volatility. Furthermore, suppose the two do converge. Does that mean you'll make money? No, it does not. What if they converge and meet at 40%? Or, worse yet, at 30%? You'd most certainly lose in those cases as the stock slowed down while your options lost time value.

Another problem with this method is that implied volatility is not necessarily low when it is bought, nor high when it is sold. Consider the example just cited. We merely knew that implied volatility was 40% and that historical volatility was 60%. We had no perspective on whether 40% was high, medium, or low. Thus, it is also necessary to see what the *percentile of implied volatility* is. If it turns out that 40% is a relatively high reading for implied volatility, as determined by looking at where implied volatility has been over the past couple of years, then we would probably *not* want to buy volatility in this situation, even though implied and historical volatility have a large discrepancy between them.

Many market-makers and floor traders use this approach. However, they are often looking for an option that is briefly mispriced, figuring that volatilities will

quickly revert back to where they were. But for a position trader, the problems cited above can be troublesome.

Having said that, if one looks to implement this method of trying to determine when options are out of line, something along the following lines should be implemented. One should ensure that implied volatility is significantly different from *all* of the pertinent historical volatilities. For example, one might require that implied volatility is less than 80% of each of the 10-, 20-, 50-, and 100-day historical volatility calculations. In addition, the current *percentile* of implied volatility should be noted so that one has some relative basis for determining if *all* of the volatilities, historical and implied, are very high or very low. One would *not* want to buy options if they were all in a very high percentile, nor sell them if they were all in a very low percentile.

Often, a volatility chart showing both the implied and certain historical volatilities will be a useful aid in making these decisions. One can not only quickly tell if the options are in a high or low percentile, but he may also be able to see what happened at similar times in the past when implied and historical volatility deviated substantially.

Finally, one needs some measure to ensure that, if convergence between implied and historical volatility *does* occur, he will be able to make money. So, for example, if one is buying a straddle, he might require that if implied rises to meet historical (say, the *lowest* of the historicals) in a month, he will actually make money. One could use a different time frame, but be careful not to make it something unreasonable. For example, if implied volatility is currently 40% and historical is 60%, it is highly unlikely that implied would rise to 60% in a day or two. Using this criterion also ensures that the *absolute* difference between implied and historical volatility is wide enough to allow for profits to be made. That is, if implied is 10% and historical is 13%, that's a difference of 30% in the two – ostensibly a "wide" divergence between implied and historical. However, if implied rises to meet historical, it will mean only an absolute increase of 3 percentage points in implied volatility – probably not enough to produce a profit, after costs, if any length of time passes.

If all of these criteria are satisfied, then one has successfully found "mispriced" options using the implied versus historical method, and he can proceed to the next step in the volatility analysis: using the probability calculator.

READING THE VOLATILITY CHART

Another technique that traders use in order to determine if options are mispriced is to actually try to analyze the *chart* of volatility – typically implied volatility, but it could be historical. This might seem to be a subjective approach, except that it is real-

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ly not much different from the GARCH approach, which is considered to be highly advanced. When one views the volatility chart, he is not looking for chart patterns like technical analysts might do with stock charts: support, resistance, head-and-shoulders, flags, pennants, and so on. Rather, he is merely looking for the *trend* of volatility to change.

This is a valid approach in the use of many indicators, particularly sentiment indicators, that can go to extreme levels. By waiting for the *trend* to change, the user is not subjecting himself to buying into the midst of a downtrend in volatility, nor selling into the midst of a steep uptrend in volatility.

Example: Suppose a volatility trader has determined that the current level of implied volatility for XYZ stock is in the 1st percentile of all past readings. Thus, the options are as cheap as they've ever been. Perhaps, though, the overall market is experiencing a very dull period, or XYZ itself has been in a prolonged, tight trading range – either of which might cause implied volatility to decline steadily and substantially. Having found these cheap options, he wants to buy volatility. However, he has no guarantee that implied volatility won't continue to decline, even though it is already as cheap as it's ever been.

If he follows the technique of waiting for a reversal in the *trend* of implied volatility, then he would keep an eye on XYZ's implied volatility daily until it had at least a modest increase, something to indicate that option buyers have become more interested in XYZ's options. The chart in Figure 39-1 shows how this situation might look.

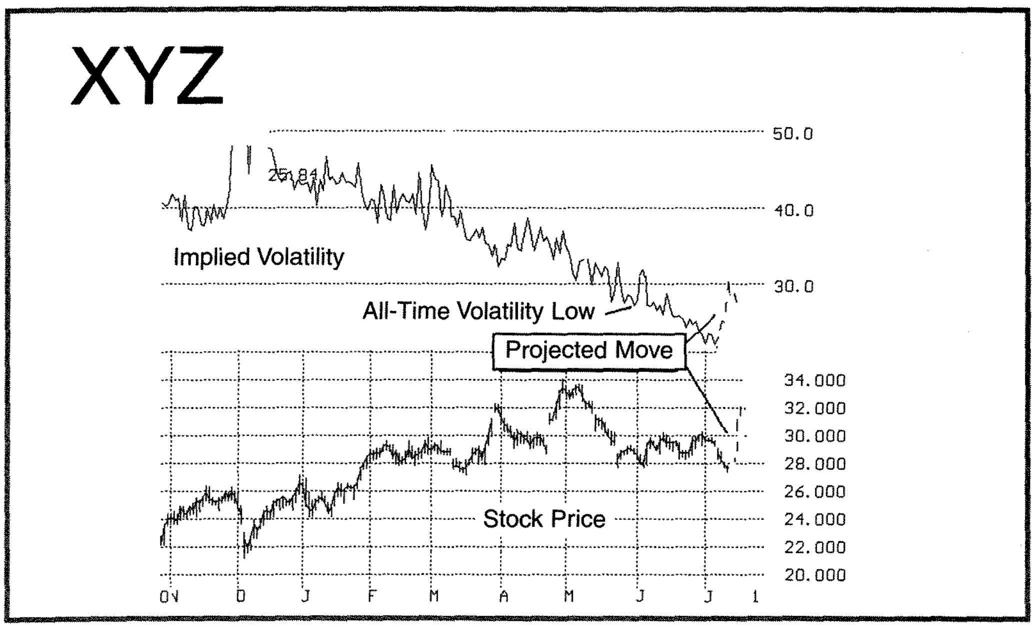
There are a number of items marked on the chart, so it will be described in detail. There are two graphs in Figure 39-1: The top line is the implied volatility graph, while on the bottom is the stock *price* chart. The implied volatility chart shows that, near the first of June, it made new all-time lows near 28% (i.e., it was in the 0th percentile of implied volatility). Hence, one might have bought volatility at that point. However, it is obvious that implied volatility was in a steep downtrend at that time, so the volatility trader who reads the charts might have decided to wait for a pop in volatility before buying. This turned out to be a judicious decision, because the stock went nowhere for nearly another month and a half, all the while volatility was dropping. At the right of the chart, implied volatility has dropped to nearly 20%.

The solid lines on the two graphs indicate the data that is known about the implied volatility and price history of XYZ. The dotted lines indicate a scenario that might unfold. If implied volatility were to jump (and the stock price might jump, too), then one might think that the trend of implied volatility was no longer down, and he would *then* buy volatility.

The reason that this approach has merit is that one never knows how low volatility can go, and more important, how *high* it can get. It was mentioned that the same sort of approach works well for other sentiment indicators, the put–call ratio, in particular. During the bull market of the 1990s, the equity-only put–call ratio generally ranged between about 30 and 55. Thus, some traders became accustomed to buying the market when the put–call ratio reached numbers exceeding 50 (high put–call ratio numbers are bullish predictors for the market in general). However, when the bull market ended, or at least faltered, the put–call ratios zoomed to heights near 70 or 75. Thus, those using a static approach (that is, "Buy at 50 or higher") were buried as they bought too early and had to suffer while the put–call ratios went to new all-time highs. A trend reversal approach would have saved them. It is a more dynamic procedure, and thus one would have let the put–call ratio continue to rise until it peaked. *Then* the market could have been bought.

This is exactly what reading the volatility chart is about. Rather than relying on past data to indicate where the absolute maxima and minima of movements might occur, one rather notes that the volatility data is at extreme levels (1st percentile or 100th percentile) and then watches it until it reverses direction. This is especially useful for options sellers, because it avoids stepping into the vortex of massive option

FIGURE 39-1.
Chart of the trend of implied volatility.



buying, where the buyers perhaps have inside information about some forthcoming corporate event such as a takeover. True, the options might *be* very expensive (100^{th} percentile), but there is a reason they are, and those with the inside information know the reason, whereas the typical volatility trader might not. However, if the volatility trader merely waits for a downturn in implied volatility readings before selling these options, he will most likely avoid the majority of trouble because the options will probably *not* lose implied volatility until news comes out or until the buyers give up (perhaps figuring that the takeover rumor has died).

Volatility *buyers* don't face the same problems with early entry that volatility sellers do, but still it makes sense to wait for the trend of volatility to increase (as in Figure 39-1) before trying to guess the bottom in volatility. Just as it is usually foolhardy to buy a stock that is in a severe downtrend, so it may be, too, with buying volatility.

A less useful approach would be to apply the same techniques to historical volatility charts, for such charts say nothing about *option* prices. See the next section for expansion on these thoughts.

COMPARING HISTORICAL VERSUS HISTORICAL

The above paragraphs summarize the three major ways that traders attempt to find options that are out of line. Sometimes, another method is mentioned: comparing current levels of historical volatility with past levels of the same measure, historical volatility. This method will be described, but it is generally an inferior method because such a comparison doesn't tell us anything about the *option* prices. It would do little good, for example, to find that current historical volatility is in a very low percentile of historical volatilities, only to learn later that the options are expensive and that perhaps implied volatility is even *higher* than historical volatility. One would normally *not* want to buy options in that case, so the initial analysis of comparing historical to historical is a wasted effort.

Comparing current levels of historical volatility with past measures of historical volatility is sort of a backward-looking approach, since historical volatility involves strictly the use of *past* stock prices. There is no consideration of implied volatility in this approach. Moreover, this method makes the tacit assumption that a stock's volatility characteristics do not change, that it will revert to some sort of "normal" past price behavior in terms of volatility. In reality, this is not true at all. Nearly every stock can be shown to have considerable changes in its historical volatility patterns over time.

Consider the historical volatilities of one of the wilder stocks of the tech stock boom, Rambus (RMBS). Historical volatilities had ranged between 50% and 110%, from the listing of RMBS stock, through February 2000. At that time, the stock averaged a price of about $20 per share.

Things changed mightily when RMBS stock began to rise at a tremendous rate in February 2000. At that time, the stock blasted to 115, pulled back to 35, made a new high near 135, and then collapsed to a price near 20. Hence, the stock itself had completed a wild round-trip over the two-year period. See Figures 39-2 and 39-3 for the stock chart and the historical volatility chart of RMBS over the time period in question.

As this happened, historical volatility skyrocketed. After February 2000, and well into 2001, historical volatility was well above 120%. Thus it is clear that the behavior patterns of Rambus changed greatly after February 2000. However, if one had been comparing historical volatilities at any time after that, he would have erroneously concluded that RMBS was about to slow down, that the historic volatilities were too high in comparison with where they'd been in the past. If this had led one to sell volatility on RMBS, it could have been a very expensive mistake.

While RMBS may be an extreme example, it is certainly not alone. Many other stocks experienced similar changes in behavior. In this author's opinion, such behavior debunks the usefulness of comparing historical volatility with past measures of historical volatility as a valid way of selecting volatility trades.

FIGURE 39-2.
Historical volatilities of RMBS.

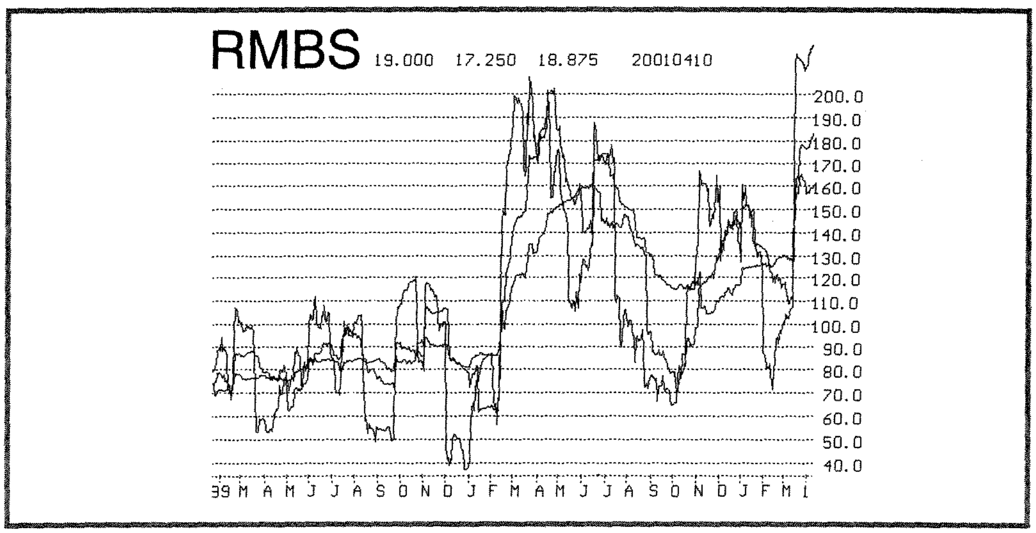
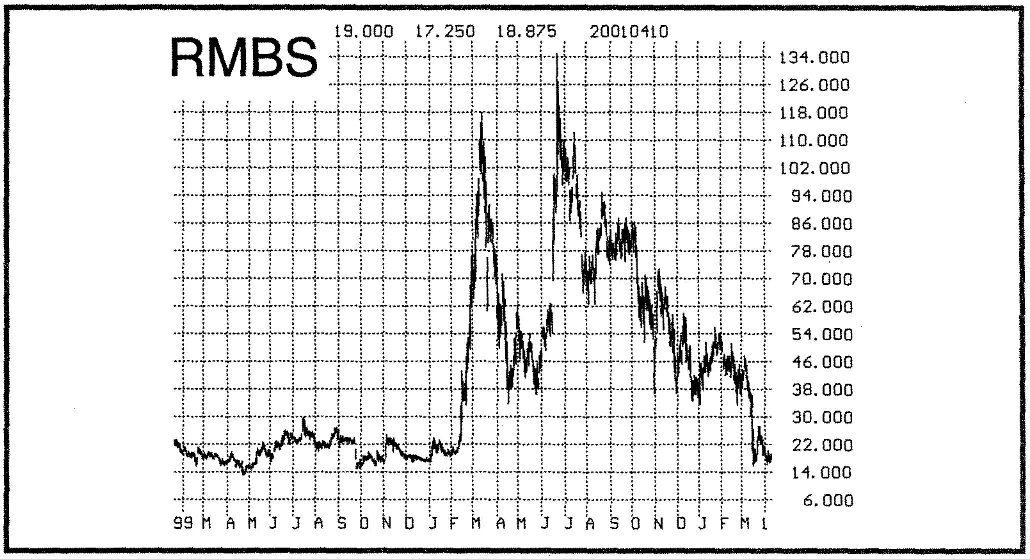


FIGURE 39-3.
Stock chart of RMBS.



What this method may be best used for is to complement the other methods described previously, in order to give the volatility trader some perspective on how volatile he can expect the underlying instrument to be; but it obviously has to be taken only as a general guideline.

CHECK THE FUNDAMENTALS

Once these mispriced options have been found, it is always imperative to check the news to see if there is some fundamental reason behind it. For example, if the options are extremely cheap and one then checks the news stories and finds that the underlying stock has been the beneficiary of an all-cash tender offer, he would *not* buy those options. The stock is not going to go anywhere, and in fact will disappear if the deal goes through as planned.

Similarly, if the options appear to be very expensive, and one checks the news and finds that the underlying has a product up for review before a governmental agency (FDA, for example), then the options should *not* be sold because the stock may be about to undergo a large gap move based on the outcome of FDA hearings. There could be any number of similar corporate events that would make the options very expensive. The seller of volatility should *not* try to intercede when such events or rumors are occurring.

However, if there is no news that would seem to explain why the options are so cheap or so expensive, then the volatility trader can continue on to the rest of his analyses.

SELECTING THE STRATEGY TO USE

In general, when one wants to trade volatility, a simple approach is best, especially if one is *buying* volatility. If there is a volatility *skew* involved, then there may be other strategies that are superior, and they are discussed in the latter part of this chapter. However, when one is interested in the straight trading of volatility because he thinks implied volatility is out of line, then only a few strategies apply.

If volatility is too low, then either a straddle or a strangle should be purchased. One would normally choose a straddle if the underlying instrument is currently trading near an available striking price. However, if the underlying is currently trading *between* two striking prices, then a strangle might be the better choice. In either case, a position trader would want to buy a straddle with several months of life remaining, in order to improve his chances of making a profit. There is no "best" time length to use, so one should use a probability calculator to aid in that decision. The use of probability calculators will be discussed shortly.

Example: XYZ is trading at 39.60 and a volatility trader has determined that he wants to buy volatility. With this information, he should attempt to buy a straddle with a striking of 40 for both the put and the call.

Suppose that the current date is in December, and the available expiration months for XYZ are January, February, April, July, and October, plus LEAPS for January of the next year. Then he would analyze each straddle (January 40, February 40, April 40, etc.) to see which is the best one to buy. It generally seems to work out that the midrange straddles have the best probabilities of success, given the way that option prices are usually structured. Of course, the actual prices of each straddle would be considered when using the probability calculator. In this case, then, the July 40 or October 40 straddle would probably be the best choices from a statistical viewpoint for a position trader.

If XYZ had been trading at a price of 37.50, say, then the trader would probably want to consider buying a strangle: buying a call with a striking price of 40 and a put with a striking price of 35. From the viewpoint of *buying* strangles, it does not make sense to separate the strikes by more than one striking price unit – 5 points for stock options, for example. This just makes the position more neutral to begin with.

Speaking of neutrality, one can also use the deltas of the options in question to alter the ratio of puts to calls, making the position initially as neutral as possible. This is the suggested approach, since the volatility buyer does not care whether the stock goes up or down. He is merely interested in stock movement and/or an increase in implied volatility.

Example: XYZ is again trading at 39.60, and the trader wants a neutral position. He should use the deltas of the options to construct a neutral position. Consider the October 40 straddle, for example. Assume the volatility used for the probability calculations is 40%. Under those conditions (and the ones assumed in the previous example), the October 40 call has a delta of 0.60 and the October 40 put has a delta of –0.40. Thus a ratio of buying 2 calls and 3 puts is a neutral ratio. If the call is selling for 6 and the put is selling for 5, then the break-even points for a 2-by-3 position would be 53.5 on the upside and 31 on the downside. This information is summarized as follows:

Delta of October 40 call:	+0.60
Delta of October 40 put:	–0.40
Delta-neutral ratio: buy 2 calls and 3 puts	
Price of October 40 call:	6.00
Price of October 40 put:	5.00
Net cost of 2-by-3 position: 27 points	
Break-even points:	Upside = 40 + 27/2 = 53.50
	Downside = 40 – 27/3 = 31.00

So, the probability calculations would endeavor to determine what the chances are of the stock *ever* trading at either 53.50 or 31.00 at any time prior to expiration. In fact, since there are straddles available in several expiration months, the strategist would want to analyze each of them in a similar fashion. Table 39-1 shows how his choices might look. If one were considering buying a *strangle,* similar calculations could be made using the deltas of the put and the call, where the call strike is higher than the put strike.

Another simple strategy that can be used when volatility is low is the calendar spread, because it has a positive vega. That is, it can be expected to expand if implied volatility increases. For most traders, though, the limited profit nature of the calen-

TABLE 39-1

	January	February	April	July	October	January LEAP
Call price	1.25	2.25	3.50	5.00	6.00	7.15
Put price	1.50	2.35	3.35	4.35	5.00	5.55
Call delta	0.48	0.52	0.55	0.58	0.60	0.62
Put delta	–0.52	–0.48	–0.45	–0.42	–0.40	–0.38
Neutral	~1-to-1	~1-to-1	~1-to-1	~2-to-3	2-to-3	~2-to-3
Debit	2.75	4.60	6.85	23.05	27.00	30.95
Upside break-even	42.75	44.60	46.85	51.57	53.50	55.47
Downside break-even	37.25	35.40	33.15	32.30	31.00	29.68

dar spread is too much of a burden, either psychologically or in terms of commissions, and so this strategy is only modestly used by volatility traders. Some traders will use the calendar spread if they don't see immediate prospects for an increase in implied volatility. They perhaps buy a call calendar slightly out-of-the-money and also buy a put calendar with slightly out-of-the-money puts. Then, if not much happens over the short term, the options that were sold expire worthless, and the remaining long straddle or strangle is even more attractive than ever. Of course, this strategy has its drawback in that a quick move by the underlying may result in a loss, something that would *not* have happened had a simple straddle or strangle been purchased.

SELLING VOLATILITY

If one were *selling* volatility (i.e., volatility is too high), his choices are more complex. Virtually anyone who has ever sold volatility has had a bad experience or two with either exploding stock prices or exploding volatility. Some of the concerns regarding the sale of volatility will be discussed at length later in this chapter. For now, the simpler strategies will be considered, in keeping with the discussion involving the creation of a volatility trading position.

Simplistically, a volatility seller would generally have a choice between one of two strategies (although there is a more complicated strategy that can be introduced as well). The simplest strategy is just to sell both an out-of-the-money put and an out-of-the-money call. The striking prices chosen should be far enough away from the current underlying price so that the probabilities of the position getting in trouble (i.e., the probabilities that the underlying actually trades at the striking prices of the naked options during the life of the position) are quite small. Just as the option buyer

above outlined several expiration months, then computed the break-even prices, so should a volatility *seller.* Generally he will probably want to sell short-term options, but all expiration months should be considered, at least initially. Also, he may want to try different strike prices in order to get a balance between a low probability of the stock reaching the striking price of the naked options and taking in enough premium to make the trade worthwhile. To this author, the sale of naked options at small fractional prices does not appear attractive.

Of course, merely selling such a put and a call means the options are naked, and that strategy is not suitable for all traders. The next best choice then, I suppose, is a credit spread. The problem with a credit spread is that one is both *selling* expensive options and also *buying* expensive options as protection. The ramifications of volatility changes on the credit spread strategy were detailed two chapters previously, so they won't be recounted here, except to say that if volatility decreases, the profits to be realized by a credit spreader are quite small (perhaps not even enough to overcome the commission expense of removing the position), whereas a naked option seller would benefit to a greater and more obvious extent.

The choice between naked writing and credit spreading should be made based largely on the philosophy and psychological makeup of the trader himself. If one feels uncomfortable with naked options, or if he doesn't have the ability to watch the market pretty much all the time (or have someone watch it for him), or if he doesn't have the financial wherewithal to margin the positions and carry them until the stock hits the break-even point, then naked writing is *not* for that trader.

Another factor that might affect the choice of strategy for the option seller is what type of underlying instrument is being considered. Index options are by far the best choices for naked option selling. Futures are next, and stocks are last. This is because of the ways those various instruments behave; stocks have by far the greatest capability of making huge gap moves that are the bane of naked option selling. So, if one has found expensive stock or futures options, that might lend more credence to the credit spread strategy.

There is one other strategy that can be employed, upon occasion, when options are expensive. It is called the volatility backspread, but its discussion will be deferred until later in the chapter.

USING A PROBABILITY CALCULATOR

No matter which method is used to find options that are out of line, and no matter which strategy is preferred by the trader, it is still necessary to use a probability calculator to get a meaningful idea of whether or not the underlying has the ability to

make the move to profitability (or *not* make the move into loss territory, if you're selling options). This is where historical volatility plays a big part, for it is the input into the probability calculator. In fact, no probability calculator will give reasonable predictions without a good estimate of volatility. Please refer to the previous chapter for a more in-depth discussion of probability calculators and stock price distributions.

The use of probability analysis also mitigates some of the problems inherent in the method of selection that compares implied and historical volatilities. If the probabilities are good for success, then we might not care so much whether the options are currently in a low percentile of implied volatility or not (although we still would not want to buy volatility when the options were in a high percentile of implied volatility and we would not want to sell options that are in a low percentile).

In using the probability calculator, one first selects a strategy (straddle buying, for example, if options are cheap) and then calculates the break-even points as demonstrated in the previous section. Then the probability calculator is used to determine what the chances are of the underlying instrument *ever* trading at one or the other of those break-even prices at any time during the life of the option position. It was shown in the previous chapter that a Monte Carlo simulation using the fat tail distribution is best used for this process.

An attractive volatility buying situation should have probabilities in excess of 80% of the underlying ever exceeding the break-even point, while an attractive volatility selling situation should have probabilities of less than 25% of ever trading at prices that would cause losses. The volatility seller can, of course, heavily influence those probabilities by choosing options that are well out-of-the-money. As noted above, the volatility seller should, in fact, calculate the probabilities on several different striking prices, striving to find a balance between high probability of success and the ability to take in enough premium to make the risk worthwhile.

Example: The OEX Index is trading at 650. Suppose that one has determined that volatilities are too high and wants to analyze the sale of some naked options. Furthermore, suppose that the choices have been narrowed down to selling the September options, which expire in about five weeks. The main choices under consideration are those in Table 39-2. The option prices in this example, being index options, reflect a volatility skew (to be discussed later) to make the example realistic.

The two right-hand columns should be rejected because the probabilities of the stock hitting one or the other of the striking prices prior to expiration are too high – well in excess of the 25% guideline mentioned earlier. That leaves the September 500-800 strangle or the September 550-750 strangle to consider. The probabilities are best for the farthest out-of-the-money options (September 500-800 strangle), but the options are selling at such small prices that they will not pro-

TABLE 39-2

Naked sale:	September 800 call September 500 put	September 750 call September 550 put	September 730 call September 570 put	September 700 call September 600 put
Call price	0.20	1.50	3.50	8.80
Put price	0.40	2.00	3.70	8.50
Probability of call strike	4%	17%	30%	44%
Probability of put strike	1%	11%	20%	40%

vide much of a return even if they expire worthless. Remember that one is required to establish the position with margin of at least 10% of the index price for naked index options, which would be $6,500 in this case. In fact, it has been recommended that one margin the position at the striking price itself (15% of 800, or $12,000 in this case). So, taking in only $60, less commissions, for the sale of the September 500-800 strangle doesn't seem to provide enough of a reward. Thus, the best choice seems to be the September 550-750 strangle. One would be making about $320 after commissions if the options expired worthless, and the recommended margin would be 15% of 750 (the higher strike), or $11,250 – a return of about 2.8% for one month. One cannot annualize these returns, for he has no idea if the same option pricing structure will exist in five weeks, when these options expire.

Other probabilities can be calculated as well. For example, suppose one has decided to buy a straddle. He might want to know what the odds are not only of breaking even, but also of making at least a certain percentage return – say 20%. One could also calculate the probability of the stock moving 20% *past* the break-even points. That distance – 20% – is a reasonable figure to use because one would most likely be taking some partial profits or adjusting his position if the stock did indeed move that far.

USING STOCK PRICE HISTORY

All of the work done so far – determining which options are expensive, selecting a strategy, and calculating the probabilities of success – has been somewhat theoretical in that we haven't done any "back testing" with regard to the volatility of the underlying instruments. At this point, one should look at past prices to see if the stock has been able to make large moves (whether or not such a move is desired).

Example: A trader is considering the purchase of the XYZ October 40 straddle for 11 points, with the stock at 39.60. The options are cheap and the probabilities of success appear to be good, according to the probability calculator. The question that now needs to be asked and answered is this: "In the past, has this stock been able to move 11 points in 10 months (the time remaining in the straddle's life)?" Or, more importantly, since 11 divided by 39.60 is about 28%, "Has this stock been able to make moves of 28% over 10 months, in the past?" The answers to these questions can be readily obtained if stock price history data is available. One could even look at a chart of the stock and attempt to answer the questions himself without the aid of a computer, but computer analysis of the price history is more rigorous and is therefore encouraged.

The answers can be expressed in the form of probabilities, much as the results of the probability calculator are.

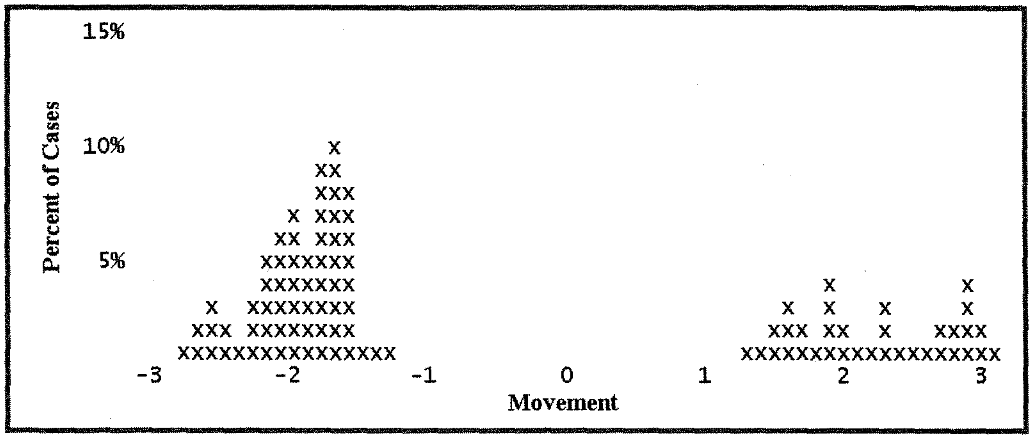
Suppose one determines that the stock has been able to move 11 points in 10 months 77% of the time in the past. That's okay, but not great. However, when one looks at the price chart of XYZ, he sees that it traded at much lower prices – near $10 a share – for a long time before rising to its current levels. It would be very hard to expect a $10 stock to move 11 points in 10 months. That's why the second figure, the one involving the 28% move, is the more significant one. In this case, one might find that XYZ has been able to move 28% in 10 months over 90% of the time in the past. *Now* one has what appears to be a decent-looking straddle buy.

This analysis of past prices can be done in a more sophisticated manner. Rather than just asking whether or not the stock has moved the required distance in the past, one might want to see just how the stock's movements "look." That is, there are a couple of scenarios under which the past movements might look attractive, but upon closer examination, one would not be so sanguine.

For example, what if XYZ had repeatedly moved 28%, but never much more in most of the 10-month periods that comprise its stock history? Then, one would be less inclined to want to own this straddle.

Another scenario of past movements might be that XYZ had made moves that one could not reasonably expect to be repeated. Perhaps there was a huge gap down on an earnings shortfall, or if it was an Internet stock around the turn of the millennium, it had a huge move upward, followed by a huge move downward. That would be another nonrepeating type of move, because absent the Internet mania, the stock might have been a rather range-bound item both prior to and after the one huge, round-trip move.

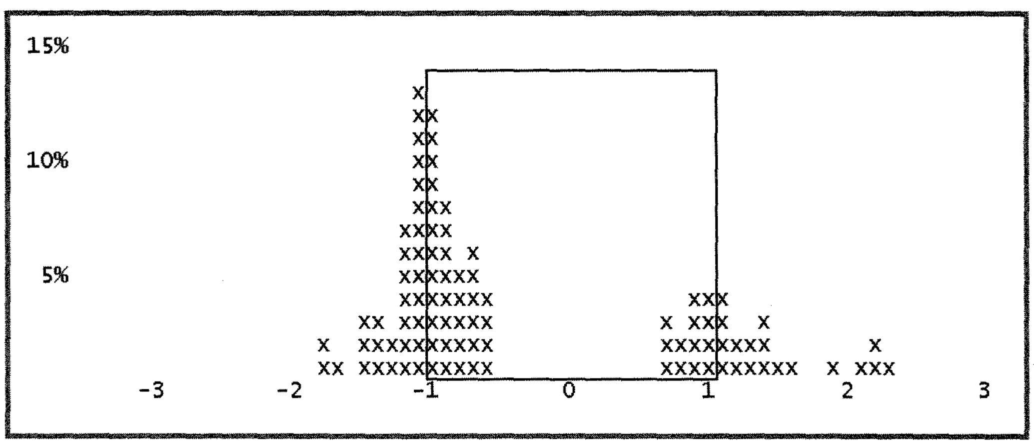
FIGURE 39-4.
Histogram of XYZ movements. (Testing 28% move in ten months.)



These problems could be addressed by merely looking at the chart, but the naked eye can be deceiving in many cases. Rather, a more rigorous approach would be to construct a histogram of these past stock movements and analyze the histogram.

Figure 39-4 shows such a histogram. The x-axis shows the magnitude of each 10-month move that is in the database of XYZ stock prices. A move to "1" would mean that it moved the 28% and no further over the 10-month period. A move to "–2" indicates that it fell 56% (twice the required distance) during the 10-month period. The y-axis (left-hand scale) shows the percentage of times that the move occurred. The sample histogram shown in Figure 39-4 is actually a very favorable one. Notice that the stock was always able to move at least 28%. Furthermore, it

FIGURE 39-5.
Example of poor movement.



moved two or three times that far with great frequency. Finally, there is a continuity to the points on the histogram: There are some y-axis data points at almost all points on the x-axis (between the minimum and maximum x-axis points). That is good, because it shows that there has not been a clustering of movements by XYZ that might have dominated past activity.

As for what is *not* a "good" histogram, we would not be so enamored of a histogram that showed a huge cluster of points near and between the "–1" and "1" points on the X-axis. We want the stock to have shown an ability to move *farther* than just the break-even distance, if possible. As an example, see Figure 39-5, which shows a stock whose movements rarely exceed the "-1" or "+1" points, and even when they do, they don't exceed it by much. Most of these would be losing trades because, even though the stock might have moved the required percentage, that was its *maximum* move during the 10-month period, and there is no way that a trader would know to take profits exactly at that time. The straddles described by the histogram in Figure 39-5 should not be bought, regardless of what the previous analyses might have shown.

Nor would it be desirable for the histogram to show a large number of movements *above* the "+3" level on the histogram, with virtually nothing below that. Such a histogram would most likely be reflective of the spiky, Internet-type stock activity that was referred to earlier as being unreasonable to expect that it might repeat itself. In a general sense, one doesn't want to see too many open spaces on the histogram's X-axis; continuity is desired.

If the histogram is a favorable one, then the volatility analysis is complete. One would have found mispriced options, with a good theoretical probability of profit, whose past stock movements verify that such movements are feasible in the future.

ANOTHER APPROACH?

After having considered the descriptions of all of these analyses, one other approach comes to mind: *Use the past movements exclusively and ignore the other analyses altogether.* This sounds somewhat radical, but it is certainly a valid approach. It's more like giving some rigor to the person who "knows" IBM can move 18 points and who therefore wants to buy the straddle. If the histogram (study of past movements) tells us that IBM does, indeed, have a good chance of moving 18 points, what do we really care about the relationship of implied and historical volatility, or about the current percentiles of either type of volatility, or what a theoretical probability calculator might say? In some sense, this is like comparing implied volatility (the price of the straddle) with historical volatility (the history of stock price movements) in a strictly practical sense, not using statistics.

In reality, one would have to be mindful of not buying overly expensive options (or selling overly cheap ones), because implied volatility cannot be ignored. However, the price of the straddle itself, which is what determines the x-axis on the histogram, does reflect option prices, and therefore implied volatility, in a nontechnical sense. This author suspects that a list of volatility trading candidates generated only by using past movements would be a rather long list. Therefore, as a practical matter, it may not be useful.

MORE THOUGHTS ON SELLING VOLATILITY

Earlier, it was promised that another, more complex volatility selling strategy would be discussed. An option strategist is often faced with a difficult choice when it comes to selling (overpriced) options in a neutral manner – in other words, "selling volatility." Many traders don't like to sell naked options, especially naked *equity* options, yet many forms of spreads designed to limit risk seem to force the strategist into a directional (bullish or bearish) strategy that he doesn't really want. This section addresses the more daunting prospect of trying to sell volatility *with protection* in the equity and futures option markets.

The quandary in trying to sell volatility is in trying to find a neutral strategy that allows one to benefit from the sale of expensive options without paying too much for a hedge – the offsetting purchase of equally expensive options. The simple strategy that most traders first attempt is the credit spread. Theoretically, if implied volatility were to fall during the time the credit spread position is in place, a profit might be realized. However, after commissions on four different options in and possibly out (assuming one sold both out-of-the-money put and call spreads), there probably wouldn't be any real profit left if the position were closed out early. In sum, there is nothing really wrong with the credit spread strategy, but it just doesn't seem like anything to get too excited about. What other strategy can be used that has limited risk and would benefit from a decline in implied volatility? The highest-priced options are the longer-term ones. If implied volatility is high, then if one can sell options such as these and hedge them, that might be a good strategy.

The simplest strategy that has the desired traits is selling a calendar spread – that is, sell a longer-term option and hedge it by buying a short-term option at the same strike. True, both are expensive (and the near-term option might even have a slightly higher implied volatility than the longer-term one). But the longer-term one trades with a far greater absolute price, so if both become cheaper, the longer-term one can decline quite a bit farther in points than the near-term one. That is, the *vega* of the longer-term option is greater than the vega of the shorter-term one. When one sells a calendar spread, it is called a *reverse calendar spread.* The strategy was

described in the chapter on reverse spreads. The reader might want to review that chapter, not only for the description of the strategy, but also for the description of the margin problems inherent in reverse spreads on stocks and indices.

One of the problems that most traders have with the reverse calendar spread is that it doesn't produce very large profits. The spread can theoretically shrink to zero after it is sold, but in reality it will not do so, for the longer-term option will retain *some* amount of time value premium even if it is very deeply in- or out-of-the-money. Hence the spread will never really shrink to zero.

Yet, there is another approach that can often provide larger profit potential and still retain the potential to make money if implied volatility decreases. In some sense it is a modification of the reverse calendar spread strategy that can create a potentially even more desirable position. The strategy, known as a *volatility backspread,* involves selling a long-term at-the-money option (just as in the reverse calendar spread) and then buying a greater number of near-er term out-of-the-money options. The position is generally constructed to be delta-neutral and it has a negative vega, meaning that it will profit if implied volatility decreases.

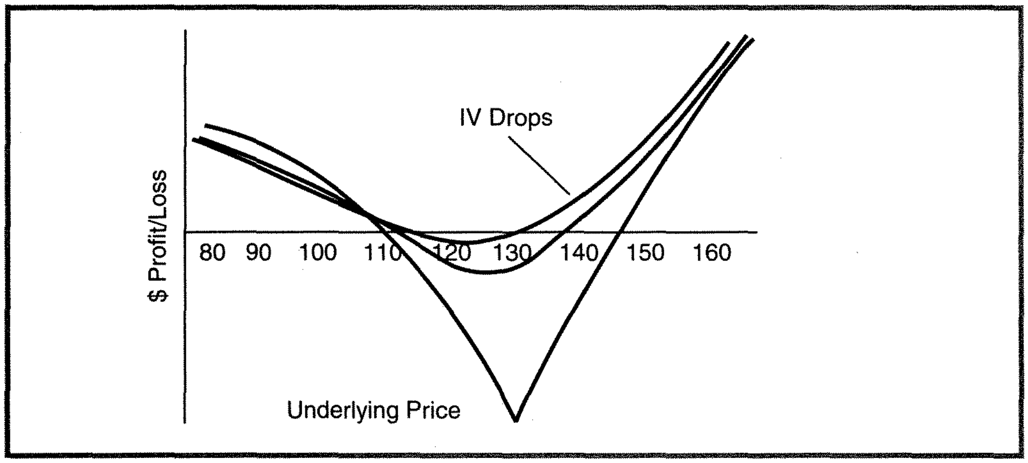
Example: XYZ is trading at 115 in early June. Its options are very expensive. A trader would like to construct a volatility backspread using the following two options:

Call Option	Price	Delta	Vega
July 130 call:	2.50	0.26	0.10
October 120 call:	13	0.53	0.27

A delta-neutral position would be to buy 2 of the July 130 calls and sell one of the October 120 calls. This would bring in a credit of 8 points. Also, it would have a small negative position vega, since two times the vega of the July calls minus one times the vega of the October call is –0.07. That is, for each one percentage point drop in implied volatility of XYZ options in general, this position would make $7 – not a large amount, but it *is* a small position.

The profitability of the position is shown in Figure 39-6. This strategy has limited risk because it does *not* involve naked options. In fact, if XYZ were to rally by a good distance, one could make large profits because of the extra long call. Meanwhile, on the downside, if XYZ falls heavily, all the options would lose most of their value and one would have a profit approaching the amount of the initial credit received. Furthermore, a decrease in implied volatility produces a small profit as well, although time decay may not be in the trader's favor, depending on exactly which short-term options were bought. The biggest risk is that XYZ is exactly at 130 at July expiration, so any strategist employing this strategy should plan to close it out

FIGURE 39-6.
Volatility backspread neutral position.



in advance of the near-term expiration. It should not be allowed to deteriorate to the point of maximum loss.

Modifications to the strategy can be considered. One is to sell even longer-term options and of course hedge them with the purchase of the near-term options. The longer-term the option is, the bigger its vega will be, so a decrease in implied volatility will cause the heftier-priced long-term option to decline more in price. This modification is somewhat tempered, though, by the fact that when options get really expensive, there is often a tendency for the near-term options to be skewed. That is, the near-term options will be trading with a much higher implied volatility than will the longer-term options. This is especially true for LEAPS options. For that reason, one should make sure that he is not entering into a situation in which the shorter-term options could lose volatility while the longer-term ones more or less retain the *same* implied volatility, as LEAPS options often do. This concept of differing volatility between near- and long-term options was discussed in more detail in Chapter 36 on the basics of volatility trading. As a sort of general rule, if one finds that the longer-term option has a much *lower* implied volatility than the one you were going to buy, this strategy is *not* recommended. As a corollary, then, *it is unlikely that this strategy will work well with LEAPS options.*

One other thing that you should analyze when looking for this type of trade is whether *it might be better to use the puts than the calls.* For one thing, you can establish a position in which the heavy profitability is on the downside (as opposed to the upside, as in the XYZ example above). Then, of course, having considered that, it might actually behoove one to establish *both* the call spread and the put spread. If

you do both, though, you create a "good news, bad news" situation. The good news is that the maximum risk is reduced; for example, if XYZ goes exactly to 130 (the worst point for the call spread), the companion put spread's credit would reduce that risk a little. However, the bad news is that there is a much wider range over which there is *not* profit, since there are two spots where losses are more or less maximized (at the strike price of the long calls and again at the strike price of the long puts).

Margin will be discussed only briefly, since it was addressed in the chapter on reverse spreads. For both index and stock options, this strategy is considered to have naked options – a preposterous assumption, since one can see from the profit graph that the position is fully hedged until the near-term options expire. This raises the capital requirement for nonmember traders. The margin anomaly is *not* a problem with futures options, however. For those options, one need only margin the difference in the strikes, less any credit received, because that is the true risk of the position. In summary, the volatility trader who wants to *sell* volatility in equity and futures options markets needs to be hedged, because gaps are prevalent and potentially very costly. This strategy creates a more neutral, less price-dependent way to benefit if implied volatility decreases, especially when compared with simple credit spreads.

SUMMARY: TRADING THE VOLATILITY PREDICTION

Attempting to establish trades when implied volatility is out of line is a theoretically attractive strategy. The process outlined above consisted of a few steps, employing both statistical and theoretical analysis. In any case, though, probability calculators must "say" that a volatility trade has good probabilities of success. It's merely a matter of what criteria we apply to limit our choices before we run the probability analysis. So, it might be more useful to view volatility trading analysis in this light:

Step 1: Use a selection criterion to limit the myriad of volatility trading choices. Any of these could be used as the first criterion, but not all of them at once:

a. Require implied volatility to be at an extreme percentile.

b. Require historical and implied volatility to have a large discrepancy between them.

c. Interpret the chart of implied volatility to see if it has reversed trend.

Step 2: Use a probability calculator to project whether the strategy can be expected to be a success.

Step 3: Using past price histories, determine whether the underlying has been able to create profitable trades in the past. (For example, if one is considering

buying a straddle, ask the question, "Has this stock been able to move far enough, with great enough frequency, to make this straddle purchase profitable?") Use histograms to ensure that the past distribution of stock prices is smooth, so that an aberrant, nonrepeatable move is not overly influencing the results.

Each criterion from Step 1 would produce a different list of viable volatility trading candidates on any given day. If a particular candidate were to appear on more than one of the lists, it might be the best situation of all.

TRADING THE VOLATILITY SKEW

In the early part of this chapter, it was mentioned that there are two ways in which volatility predictions could be "wrong." The first was that implied volatility was out of line. The second is that individual options on the same underlying instrument have significantly different implied volatilities. This is called a volatility skew, and presents trading opportunities in its own right.

DIFFERING IMPLIED VOLATILITIES ON THE SAME UNDERLYING SECURITY

The implied volatility of an option is the volatility that one would have to use as input to the Black-Scholes model in order for the result of the model to be equal to the current market price of the option. Each option will thus have its own implied volatility. Generally, they will be fairly close to each other in value, although not exactly the same. However, in some cases, there will be large enough discrepancies between the individual implied volatilities to warrant the strategist's attention. It is this latter condition of large discrepancies that will be addressed in this section.

Example: XYZ is trading at 45. The following option prices exist, along with their implied volatilities:

Option	Actual Price	Implied Volatility
January 45 call	2.75	41%
January 50 call	1.25	47%
January 55 call	0.63	53%
February 45 call	3.50	38%
February 50 call	4.00	45%

Note that the implied volatilities of the individual options range from a low of 38% to a high of 53%. This is a rather large discrepancy for options on the same underlying security, but it is useful for exemplary purposes.

A neutral strategy could be established by buying options with lower implied volatilities and simultaneously selling ones with higher volatilities, such as buy 10 February 45 calls and sell 20 January 50 calls. Examples of neutral spreads will be expanded upon in the next chapter, when more exact measures for determining how many calls to buy and sell are discussed.

Before jumping into such a position, the strategist should ask himself if there is a valid reason why the different options have such different implied volatilities. As a generalization, it might be fair to say that out-of-the-money options have slightly higher implieds than at-the-money ones, and that longer-term options have lower implieds than short-term ones. But there are many instances in which such is not the case, so one must be careful not to overgeneralize.

Speculators often desire the lowest dollar-cost option available. Thus, in a takeover rumor situation, they would buy the out-of-the-moneys as opposed to the higher-priced at- or in-the-moneys. If the out-of-the-moneys are extremely expensive because of a takeover rumor, then the strategist must be careful, because the neutral strategy concept may lead him into selling naked calls. This is not to say he should avoid the situation altogether; he may be able to structure a position with enough upside room to protect himself, or he may believe the rumors are false.

Returning to the general topic of differing implied volatilities on the same underlying stock, the strategist might ask how he is to determine if the discrepancies between the individual options are significantly large to warrant attention. A mathematical approach is presented at the end of the next chapter in a section on advanced mathematical concepts. Suffice it to say that there is a way that the differences in the various implieds can be reduced to a single number – a sort of "standard deviation of the implieds" that is easy for the strategist to use. A list of these numbers can be constructed, comparing which stocks or futures might be candidates for this type of neutral spreading. On a given day, the list is usually quite short – perhaps 20 stocks and 10 futures contracts will qualify.

The concept of the implied volatilities of various options on the same underlying stock remaining out of line with each other is one that needs more discussion. In the following section, the idea of semipermanent distortion between the volatilities of different striking prices is discussed.

VOLATILITY SKEWING

After the stock market crashed in 1987, index options experienced what has since proven to be a permanent distortion: Out-of-the-money puts have remained more expensive than out-of-the-money calls. Furthermore, out-of-the-money puts are more expensive than at-the-money puts; out-of-the-money calls are cheaper than at-the-money calls. This distorted effect is due to several factors, but it is so deep-seated that it has remained through all kinds of up and down markets since then. Other markets, particularly futures markets, have also experienced a long-lasting distortion between the implied volatilities at various strikes.

The proper name given to this phenomenon is *volatility skewing: the long-lasting effect whereby options at different striking prices trade with differing implied volatilities.* It should be noted that the calls and puts at the same strike must trade for the same implied volatility; otherwise, conversion or reversal arbitrage would eliminate the difference. However, there is no true arbitrage between different striking prices. Hence, arbitrage cannot eliminate volatility skewing.

Example: Volatility skewing exists in OEX index options. Assume the average volatility of OEX and its options is 16%. With volatility skewing present, the implied volatilities at the various striking prices might look like this:

OEX: 580

Strike	Implied Volatility of Both Puts and Calls
550	22%
560	19%
570	17%
580	16%
590	15%
600	14%
610	13%

In this form of volatility skewing, the out-of-the-money puts are the most expensive options; the out-of-the-money calls are the cheapest. This pattern of implied volatilities is called a *reverse volatility skew* or, alternatively, a *negative volatility skew.*

The causes of this effect stem from the stock market's penchant to crash occasionally. Investors who want protection buy index puts; they don't sell index futures as much as they used to because of the failure of the portfolio insurance strategy during the 1987 crash. In addition, margin requirements for selling naked index puts have increased, especially for market-makers, who are the main suppliers of naked puts. Consequently, demand for index puts is high and supply is low. Therefore, out-of-the-money index puts are overly expensive.

This does not entirely explain why index calls are so cheap. Part of the reason for that is that institutional traders can help finance the cost of those expensive index puts by selling some out-of-the-money index calls. Such sales would essentially be covered calls if the institution owned stocks, which it most certainly would. This strategy is called a *collar.*

This distortion in volatilities is not in accordance with the probability distribution of stock prices. These distorted implied volatilities define a different probability curve for stock movement. They seem to say that there is more chance of the market dropping than there is of it rising. This is not true; in fact, just the opposite is true. Refer to the reasons for using lognormal distribution to define stock price movements. Consequently, there are opportunities to profit from volatility skewing, if one is able to hold the position until expiration.

It was shown in previous examples that one would attempt to sell the options with higher implied volatilities and buy ones with lower implieds as a hedge. Hence, for OEX traders, three strategies seem relevant:

1. Buy a bear put spread in OEX.

   Example: Buy 10 OEX June 560 puts
   Sell 10 OEX June 540 puts

2. Buy OEX puts and sell a larger number of out-of-the-money puts – a ratio write of put options.

   Example: Buy 10 OEX June 560 puts
   Sell 20 OEX June 550 puts

3. Sell OEX calls and buy a larger number of out-of-the-money calls – a backspread of call options.

   Example: Buy 20 OEX June 590 calls
   Sell 10 OEX June 580 calls

In all three cases, one is selling the higher implied volatility and buying options with lower implied volatilities. The first strategy is a simple bear spread. While it will

benefit from the fact that the options are skewed in terms of implied volatility, it is not a neutral strategy. It requires that the underlying drop in price in order to become profitable. There is nothing wrong with using a directional strategy like this, but the strategist must be aware that the skew is unlikely to disappear (until expiration) and therefore the index price movement is going to be necessary for profitability.

The second strategy would be best suited for moderately bearish investors, although a severe market decline might drive the index so low that the additional short puts could cause severe losses. However, *statistically* this is an attractive strategy. At expiration, the volatility skewing must disappear; the markets will have moved in line with their real probability distribution, not the false one being implied by the skewed options. This makes for a potentially profitable situation for the strategist.

The backspread strategy would work best for bullish investors, although some backspreads can be created for credits, so a little money could also be made if the index fell. In theory, a strategist could implement both strategies simultaneously, which would give him an edge over a wide range of index prices. Again, this does not mean that he cannot lose money; it merely means that his strategy is statistically superior because of the way the options are priced. That is, the odds are in his favor.

In reality, though, a neutral trader would choose either the ratio spread or the backspread – not both. As a general rule of thumb, one would use the ratio spread strategy if the current level of implied volatility were in a high percentile. The backspread strategy would be used if implied volatility were in a *low* percentile currently. In that way, a movement of implied volatility back toward the 50th percentile would also benefit the trade that is in place.

Another interesting thing happens in these strategies that may be to their benefit: The volatility skewing that is present propagates itself throughout the striking prices as OEX moves around. It was shown in the previous section's example that one should probably continue to project his profits using the distorted volatilities that were present when he establishes a position. This is a conservative approach, but a correct one. In the case of these OEX spreads, it may be a benefit.

Assuming that the skewing is present wherever OEX is trading means that the at-the-money strike will have 16% as its implied volatility regardless of the absolute price level; the skewing will then extend out from that strike. So, if OEX rises to 600, then the 600 strike would have a volatility of 16%; or if it fell to 560, then the 560 puts and calls would have a volatility of 16%. Of course, 16% is just a representative figure; the "average" volatility of OEX can change as well. For illustrative purposes, it is convenient to assume that the at-the-money strike keeps a constant volatility.

Example: Initially, a trader establishes a call backspread in OEX options in order to take advantage of the volatility skewing:

Initial situation: OEX: 580

Option	Implied Volatility	Delta
June 590 call	15%	0.40
June 600 call	14%	0.20

A neutral spread would be:

Buy 2 June 600 calls
Sell 1 June 590 call

since the deltas are in the ratio of 2-to-1.

Now, suppose that OEX rises to 600 at a later date, but well before expiration. This is not a particularly attractive price for this position. Recall that, at expiration, a backspread has its worst result at the striking price of the purchased options. Even prior to expiration, one would not expect to have a profit with the index right at 600.

However, the statistical advantage that the strategist had to begin with might be able to help him out. The present situation would probably look like this:

Option	Implied Volatility
June 590 call	17%
June 600 call	16%

The June 600 call is now the at-the-money call, since OEX has risen to 600. As such, its implied volatility will be 16% (or whatever the "average" volatility is for OEX at that time – the assumption is made that it is still 16%). The June 590 call has a slightly higher volatility (17%) because volatility skewing is still present.

Thus, the options that are long in this spread have had their implied volatility *increase*; that is a benefit. Of course, the options that are short had theirs increase as well, but the overall spread should benefit for two reasons:

1. Twice as many options are owned as were sold.
2. The effect of increased volatility is greatest on the at-the-money option; the in-the-money will be affected to a lesser degree.

All index options exhibit this volatility skewing. Volatility skewing exists in other markets as well. The other markets where volatility skewing is prevalent are usually

futures option markets. In particular, gold, silver, sugar, soybeans, and coffee options will from time to time display a form of volatility skewing that is the opposite of that displayed by index options. In these futures markets, the cheapest options are out-of-the-money puts, while the most expensive options are out-of-the-money calls.

Example: January soybeans are trading at 580 ($5.80 per bushel). The following table of implied volatilities shows how volatility skewing that is present in the soybean market is the opposite of that shown by the OEX market in the previous examples:

January beans: 580

Strike	Implied Volatility
525	12%
550	13%
575	15%
600	17%
625	19%
650	21%
675	23%

Notice that the out-of-the-money calls are now the more expensive items, while out-of-the-money puts are the cheapest. This pattern of implied volatilities is called *forward volatility skew* or, alternatively, *positive volatility skew.*

The distribution of soybean prices implied by these volatilities is just as incorrect as the OEX one was for the stock market. This soybean implied distribution is too bullish. It implies that there is a much larger probability of the soybean market rising 100 points than there is of it falling 50 points. That is incorrect, considering the historical price movement of soybeans.

A strategist attempting to benefit from the forward (or positive) volatility skew in this market has essentially three strategies available. They are the opposite of the three recommended for the $OEX, which had a reverse (or negative) volatility skew. First would be a call bull spread, second would be a put backspread, and third would be a call ratio spread. In all three cases, one would be buying options at the *lower* striking price and selling options at the *higher* striking price. This would give him the theoretical advantage.

The same sorts of comments that were made about the OEX strategies can be applied here. The bull spread is a directional strategy and can probably only be expected to make money if the underlying *rises* in price, despite the statistical advan-

tage of the volatility skew. The put backspread is best established when the overall level of implied volatility is in a low percentile. Finally, the call ratio spread has a great deal of risk to the upside (and futures prices can fly to the upside quickly, especially if bad fundamental conditions develop, such as weather in the grain markets). The call ratio spread would best be used when implied volatilities are already in a high percentile.

As a general comment, it should be noted that if the volatility skew disappears while the trader has the position in place, a profit will generally result. It would normally behoove the strategist to take the profit at that time. Otherwise, follow-up action should adhere to the general kinds of action recommended for the strategies in question: protective action to prevent large losses in the case of the ratio spreads, or the taking of partial profits and possibly rolling the long options to a more at-the-money strike in the case of the backspread strategies.

SUMMARY OF VOLATILITY SKEWING

Whenever volatility skewing exists – no matter what market – opportunities arise for the neutral strategist to establish a position that has advantages. These advantages arise out of the fact that normal market movements are different from what the options are implying. Moreover, the options are wrong when there is skewing at all strikes, from the lowest to the highest. The strategist should be careful to project his profits prior to expiration using the same skewing, for it may persist for some time to come. However, at expiration, it must of course disappear. Therefore, the strategist who is planning to hold the position to expiration will find that volatility skewing has presented him with an opportunity for a positive expected return.

SUMMARY OF VOLATILITY TRADING

The theoretical trading of options, mostly in a neutral manner, has evolved into one large branch – volatility trading. This part of the book has attempted to lay out the foundations, structures, and practices prevalent in this branch of trading. As the reader can see, there are some sophisticated techniques being applied – not so much in terms of strategy, but in terms of the ways that one looks at volatility and in the ways that stocks can move.

Statistical methods are used liberally in trying to determine the ways that either volatility can move or stocks can move. The probability calculators, stock price distributions, and related topics are all statistical in nature. The volatility trader is intent on finding situations in which current market implied volatility is incorrect, either in its absolute value or in the skew that is prevalent in the options on a particular under-

lying instrument. Upon finding such discrepancies, the trader attempts to take advantage by constructing a more or less neutral position, preferring not to predict price so much, but rather attempting to predict volatility.

Most volatility traders attempt to *buy* volatility rather than sell it, for the reasons that the strategies inherent in doing so have limited risk and large potential rewards, and don't require one to monitor them continuously. If one owns a straddle, any major market movements resulting in gaps in prices are a benefit. Hence, monitoring of positions as little as just once a day is sufficient, a fact that means that the volatility buyer can have a life apart from watching a trading screen all day long. In addition, volatility buyers of stock options can avail themselves of the chaotic movements that stocks can make, taking advantage of the occasional fat tail movements.

However, since volatility and prices are so unstable, one cannot predict their movements with any certainty. The vagaries of historical volatility as compared to implied volatility, the differences between the implied volatility of short- and long-term options, and the difficulty in predicting stock price distributions all complicate the process of predicting volatility. Hence, volatility trading is not a "lock," but its practitioners normally believe that it is by far the best approach to theoretical option trading available today. Moreover, most option professionals primarily trade volatility rather than directional positions.

CHAPTER 40

Advanced Concepts

As the option markets have matured, strategists have been forced to rely more on mathematics in order to select new positions as well as to discern how their positions will behave in fluctuating markets. These techniques can be used on simple strategies, such as bull spreads or ratio spreads, or on far more complex portfolios of options.

First, the concept of implied volatility will be examined in more detail, primarily as an aid in choosing new positions that have a positive expected return. Then, the concept of risk management will be explored. In effect, one can reduce his option position into several components of risk measurement that can be readily understood. This chapter describes the techniques used to evaluate one's position, and shows how to use this information to reduce the risk in the position. The actual mathematical calculations required to perform these analyses are included at the end of the chapter.

NEUTRALITY

In many of the examples in previous chapters, it was generally assumed that one would take a "neutral" position in order to capture the pricing or volatility differential. Why this concentration on neutrality? Neutrality, as it applies to option positions, means that one is noncommittal with respect to at least one of the factors that influence an option's price. Simply put, this means that one can design an option position in which he can profit, no matter which way the underlying security moves.

Most option strategies fall into one of two categories: as a hedge to a stock or futures strategy (for example, buying puts to protect a portfolio of stocks), or as a profit venture unto itself. The latter category is where most traders find themselves, and they often approach it in a fairly speculative manner – either by buying options or by being a premium seller (covered or uncovered). In such strategies, the trader is taking a view of the market; he needs certain price action from the underlying security in order to profit. Even covered call writing, which is considered to be a conservative strategy, is subject to large losses if the underlying stock drops drastically.

It doesn't have to be that way. Strategies can be devised that will have a chance to profit regardless of price changes in the underlying stock, as well as *because* of them. Such strategies are neutral strategies and they always require at least two options in the position – a spread, straddle, or some other combination. Often, when one constructs a neutral strategy, he is neutral with respect to price changes in the underlying security. It is also possible, and often wise, to be neutral with respect to the *rate of price change of the underlying security,* with respect to the *volatility* of the security, or with respect to *time decay.* This is not to imply that any option spread that is neutral will automatically be a money-maker; rather, one looks for an opportunity – perhaps an overpriced series of options – and attempts to capture that overpricing by constructing a neutral strategy around it. Then, regardless of the movement of the underlying stock, the strategist has a chance of making money if the overpricing disappears.

Note that the neutral approach is distinctly different from the speculator's, who, upon determining that he has discovered an underpriced call, would merely buy the call, hoping for the stock to increase in price. He would not make money if XYZ fell in price unless there was a huge expansion in implied volatility – not something to count on. The next section of this chapter deals with how one determines his neutrality. In effect, if he is not neutral, then he has risk of some sort. The following sections outline various measures of risk that the strategist can use to establish a new position or manage an existing one.

The most important of these risk measurements is how much market exposure the position currently has. This has previously been described as the "delta." Of nearly equal importance to the strategist is how much the option strategy will change with respect to the rate of change in the price of the underlying security. Also of interest are how changes in volatility, in time remaining until expiration, or even in the risk-free interest rate will affect the position. Once the components of the option position are defined, the strategist can then take action to reduce the risk associated with any of the factors, should he so desire.

THE "GREEKS"

Risk measurements have generally been given the names of actual or contrived Greek letters. For example, "delta" was discussed in previous chapters. It has become common practice to refer to the exposure of an option position merely by describing it in terms of this "Greek" nomenclature. For example, "delta long 200 shares" means that the entire option position behaves as if the strategist were merely long 200 shares of the underlying stock. In all, there are six components, but only four are heavily used.

DELTA

The first risk measurement that concerns the option strategist is *how much current exposure his option position has as the underlying security moves.* This is called the "delta." In fact, the term *delta* is commonly used in at least two different contexts: to express the amount by which an option changes for a 1-point move in the underlying security, or to describe the equivalent stock position of an entire option portfolio.

Reviewing the definition of the delta of an individual option (first described in Chapter 3), recall that the delta is a number that ranges between 0.0 and 1.0 for calls, and between −1.0 and 0.0 for puts. It is the amount by which the option will move if the underlying stock moves 1 point; stated another way, it is the percentage of any stock price change that will be reflected in the change of price of the option.

Example: Assume an XYZ January 50 call has a delta of 0.50 with XYZ at a price of 49. This means that the call will move 50% as fast as the stock will move. So, if XYZ jumps to 51, a gain of 2 points, then the January 50 call can be expected to increase in price by 1 point (50% of the stock increase).

In another context, the delta of a call is often thought of as the probability of the call being in-the-money at expiration. That is, if XYZ is 50 and the January 55 call has a delta of 0.40, then there is a 40% probability that XYZ will be over 55 at January expiration.

Put deltas are expressed as negative numbers to indicate that put prices move in the opposite direction from the underlying security. Recall that deltas of out-of-the-money options are smaller numbers, tending toward 0 as the option becomes very far out-of-the-money. Conversely, deeply in-the-money calls have deltas approaching 1.0, while deeply in-the-money puts have deltas approaching −1.0. Note: Mathematically, the delta of an option is the partial derivative of the Black–Scholes equation (or whatever formula one is using) with respect to stock price. Graphically, it is the slope of a line that is tangent to the option pricing curve.

Let us now take a look at how both volatility and time affect the delta of a call option. Much of the data to be presented in this chapter will be in both tabular and graphical form, since some readers prefer one style or the other.

The volatility of the underlying stock has an effect on delta. If the stock is not volatile, then in-the-money options have a higher delta, and out-of-the-money options have a lower delta. Figure 40-1 and Table 40-1 depict the deltas of various calls on two stocks with differing volatilities. The deltas are shown for various strike prices, with the time remaining to expiration equal to 3 months and the underlying stock at a price of 50 in all cases. Note that the graph confirms the fact that a low-volatility stock's in-the-money options have the higher delta. The opposite holds true for out-of-the-money options: The high-volatility stock's options have the higher delta in that case. Another way to view this data is that a higher-volatility stock's options will always have more time value premium than the low-volatility stock's. In-the-money, these options with more time value will not track the underlying stock price movement as closely as ones with little or no time value. Thus, in-the-money, the low-volatility stock's options have the higher delta, since they track the underlying stock price movements more closely. Out-of-the-money, the entire price of the option is composed of time value premium. The ones with higher time value (the ones on the high-volatility stock) will move more since they have a higher price. Thus, out-of-the-money, the higher-volatility stock's options have the greater delta.

Time also affects delta. Figures 40-2 (see Table 40-2) and 40-4 show the relationships between time and delta. Figure 40-2's scales are similar to those in Figure 40-2, delta vs. volatility: The deltas are shown for various striking prices, with XYZ assumed to be equal to 50 in all cases. Notice that in-the-money, the shorter-term options have the higher delta. Again, this is because they have the least time value premium. Out-of-the-money, the opposite is true: The longer-term options have the higher deltas, since these options have the most time value premium.

Figure 40-3 (see Table 40-3) depicts the delta for an XYZ January 50 call with XYZ equal to 50. The horizontal axis in this graph is "weeks until expiration." Note that the delta of a longer-term at-the-money option is larger than that of a shorter-term option. In fact, the delta shrinks more rapidly as expiration draws nearer. Thus, even if a stock remains unchanged and its volatility is constant, the delta of its options will be altered as time passes. This is an important point to note for the strategist, since he is constantly monitoring the risk characteristics of his position. He cannot assume that his position is the same just because the stock has remained at the same price for a period of time.

Position Delta. Another usage of the term *delta* is what has previously been referred to as the equivalent stock position (ESP); for futures options, it would be

FIGURE 40-1.
Delta comparison, with XYZ = 50.

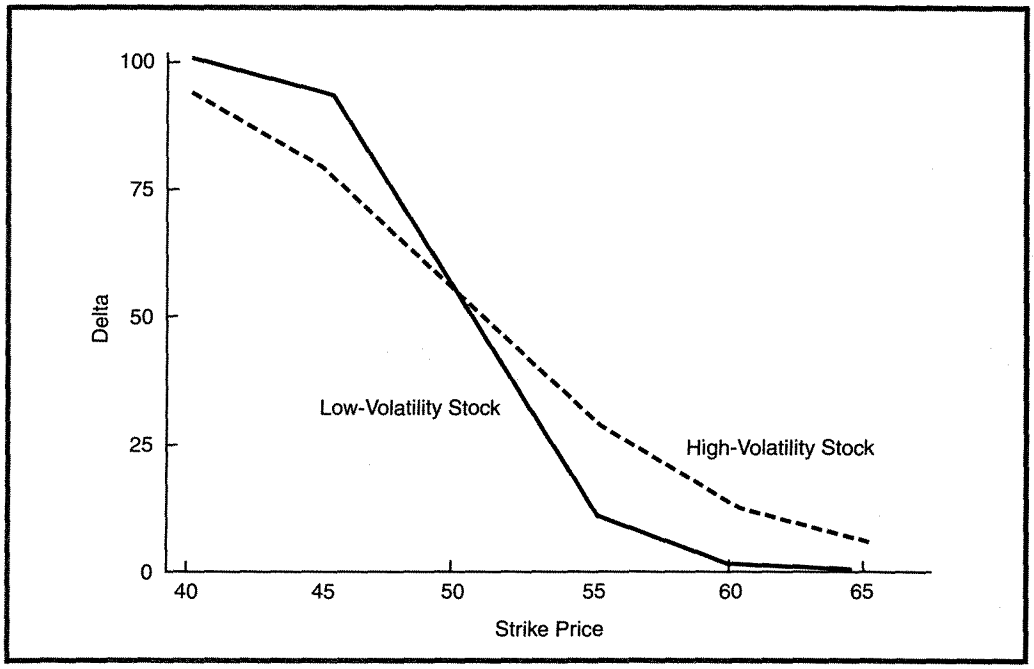


TABLE 40-1.
Delta comparison for different volatilities with XYZ = 50 and time = 3 months.

	Delta	
Strike Price	Low-Volatility Stock	High-Volatility Stock
40	100	94
45	93	78
50	51	53
55	11	29
60	1	13
65	0	5

referred to as EFP (equivalent futures position). To differentiate between the two terms, the delta of the option is generally referred to as "option delta," while the ESP or EFP is called "position delta." Recall that the position delta is computed according to the following simple equation:

Position delta = Option's delta × Shares per option × Option quantity

FIGURE 40-2.
Delta comparison, with XYZ = 50.

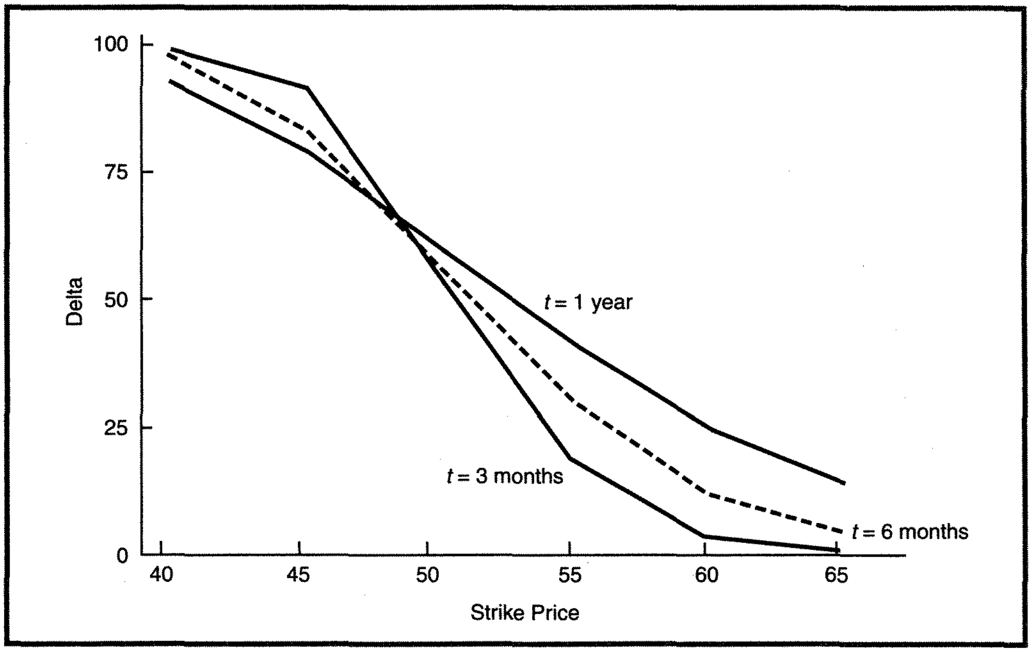


TABLE 40-2.
Delta comparison – varying time remaining with XYZ = 50.

	Delta		
Strike Price	t = 1 year	t = 6 months	t = 3 months
40	92	97	99
45	79	83	90
50	61	57	55
55	41	30	18
60	25	12	3
65	14	4	0

For futures options, the term "shares per option" would be replaced by "shares per contract," which is always 1. This is the risk measurement of how much market exposure the option position has. Whether called position delta, ESP, or EFP, one uses the deltas of the individual options in his portfolio to calculate the overall exposure. By summing the calculations for each item in a position, or even in an entire option portfolio, one can approximate how much market exposure the entire option

FIGURE 40-3.
Delta as a function of time.

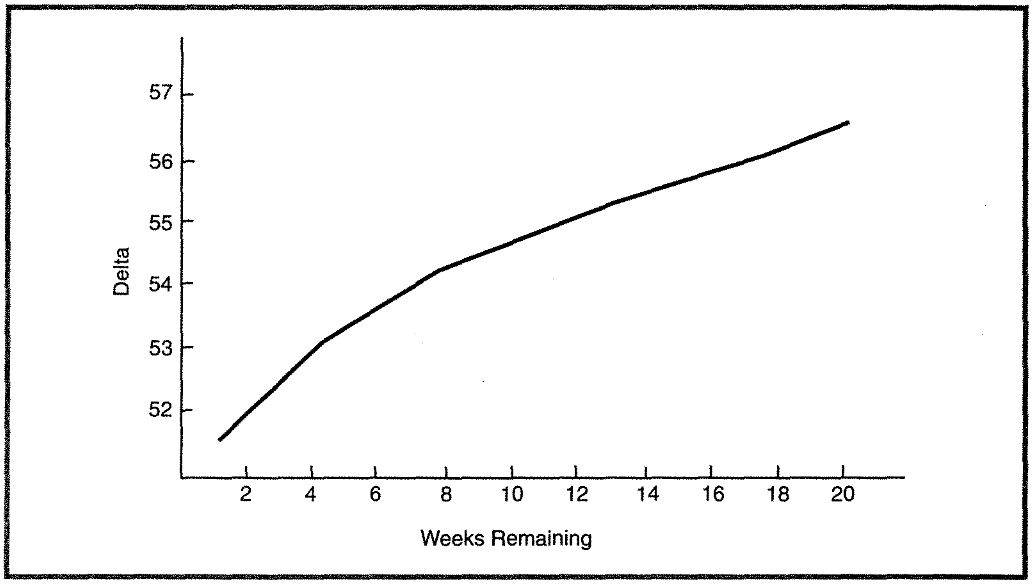


TABLE 40-3.
Delta as a function of time.

Weeks Remaining	Delta
20	.566
18	.562
15	.557
13	.553
10	.547
8	.543
6	.538
4	.531
2	.521
1	.515

position has. The next example, reprinted from the chapter on mathematical applications, shows how one computes the net exposure of a complicated position.

Example: The following position exists when XYZ is at 31.75. It resembles a long straddle (or backspread), in that there is increased profit potential in either direction

if the stock moves far enough by expiration. Many market-makers and professional traders attempt to structure these types of positions, if possible, in order to take advantage of the sudden volatility that is inherent in today's markets.

Position	Delta	Position Delta
Short 4,500 XYZ	1.00	– 4,500
Short 100 XYZ April 25 calls	0.89	– 8,900
Long 50 XYZ April 30 calls	0.76	+ 3,800
Long 139 XYZ July 30 calls	0.74	+10,286
	Total ESP:	+ 686

This position, though complicated to the naked eye, reduces to being long only approximately 700 shares of XYZ. This is commonly referred to as being "delta long 700 shares." Thus, the terms "delta," when referring to the sum of the deltas of a whole position, and "equivalent stock position" are synonymous.

This position has some exposure to the market since it is delta long. If the position delta were zero, it would be referred to as being delta neutral and would, theoretically, have no exposure to the market at that time.

Note that one can derive some general characteristics of his delta by just examining his portfolio by eye: Short calls or long puts will introduce negative delta into the position; long calls or short puts will introduce positive delta. Furthermore, it is obvious that being long the underlying security adds to the long delta of the position, while being short the underlying security places more negative delta in the position. The use of this information to adjust the delta of one's position will be discussed in a later section of this chapter.

Obviously, the delta of this entire position will change as the stock price moves up or down as time passes. The figure given is merely an instantaneous look at how the position is structured. It is the need to know how the position will change when other factors change that has led strategists to employ the following concepts.

GAMMA

Simply stated, *the gamma is how fast the delta changes* with respect to changes in the underlying stock price. It is known that the delta of a call increases as the call moves from out-of-the-money to in-the-money. The gamma is merely a precise measurement of how fast the delta is increasing.

Example: With XYZ at 49, assume the January 50 call has a delta of 0.50 and a gamma of 0.05. If XYZ moves up one point to 50, the delta of the call will increase by the amount of the gamma: It will increase from 0.50 to 0.55.

As with the delta, the gamma can also be expressed as a percentage. But in this case, the increase or decrease applies to the delta.

Example: Again, with XYZ at 49, assume the January 50 call has a delta of 0.50 and a gamma of 0.05. If XYZ moves up 2 points to 51, the delta of the call will increase by 5% of the *stock move,* because the *gamma* is 0.05, or 5 percent. Five percent of the *stock move* is 0.05×2, or 0.10. Thus, the delta will increase by 0.10, from 0.50 to 0.60.

Obviously, the delta cannot keep increasing by 0.05 each time XYZ gains another point in price, for it will eventually exceed 1.00 by that calculation, and it is known that the delta has a maximum of 1.00. Thus, it is obvious that the gamma changes. In general, *the gamma is at its maximum point when the stock is near the strike of the option.* As the stock moves away from the strike in either direction, the gamma decreases, approaching its minimum value of zero.

Conceptually, this means that a deeply in-the-money or deeply out-of-the-money option has a *gamma* of nearly zero. This makes sense – it implies that the *delta* of a deep in- or deep out-of-the-money option does not change very much at all, even if the stock moves by one point.

Example: Assume XYZ is 25, and the January 50 call has a delta of virtually zero. If XYZ moves up one point to 26, the call is still so far out-of-the-money that the delta will still be zero. Thus, the gamma of this call is zero, since the delta does not change when the stock increases in price by a point.

In a similar manner, the January 45 put on XYZ would have a delta of –1.0 with XYZ at 25. If XYZ moved up one point to 26, the put's delta would not change; it is still so far in-the-money that it would still be –1.0. Thus, the gamma of this deeply in-the-money option is also zero, since the delta remains unchanged in the face of a 1-point rise in the underlying security.

Note that the gamma of any option is expressed as a positive number, whether the option is a put or a call.

Other properties of gamma are useful to know as well. As expiration nears, the gamma of at-the-money options increases dramatically. Consider an option with a day or two of life remaining. If it is at-the-money, the delta is approximately 0.50. However, if the stock were to move 2 points higher, the delta of the option would jump

to nearly 1.00 because of the short time remaining until expiration. Thus, the gamma would be roughly 0.25 (the delta increased by 0.50 when the stock moved 2 points), as compared to much smaller values of gamma for at-the-money options with several weeks or months of life remaining. The same 2-point rise in the underlying stock would not result in much of an increase in the delta of longer-term options at all.

Out-of-the-money options display a different relationship between gamma and time remaining. An out-of-the-money option that is about to expire has a very small delta, and hence a very small gamma. However, if the out-of-the-money option has a significant amount of time remaining, then it will have a larger gamma than the option that is close to expiration.

Figure 40-4 (see Table 40-4) depicts the gammas of three options with varying amounts of time remaining until expiration. The properties regarding the relationship of gamma and time can be observed here. Notice that the short-term options have very low gammas deeply in- or out-of the-money, but have the highest gamma at-the-money (at 50). Conversely, the longest-term, one-year option has the highest gamma of the three time periods for deeply in- or out-of-the-money options. The data is presented in Table 40-4. This table contains a slight amount of additional data: the gamma for the at-the-money option at even shorter periods of time remaining until expiration. Notice how the gamma explodes as time decreases, for the at-the-money option. With only one week remaining, the gamma is over 0.28, meaning that the delta of such a call would, for example, jump from 0.50 to 0.78 if the stock merely moved up from 50 to 51.

Gamma is dependent on the volatility of the underlying security as well. At-the-money options on less volatile securities will have higher gammas than similar options on more volatile securities. The following example demonstrates this fact.

Example: Assume XYZ is at 49, as is ABC. Moreover, XYZ is a more volatile stock (30% implied) as compared to ABC (20%). Then, similar options on the two stocks would have significantly different gammas.

Option	XYZ Gammas (Volatility = 30%)	ABC Gammas (Volatility = 20%)
January 50	.066	.097
January 55	.045	.039
January 60	.019	.0053
February 50	.055	.081
February 60	.024	.011

FIGURE 40-4.
Gamma comparison, with XYZ = 50.

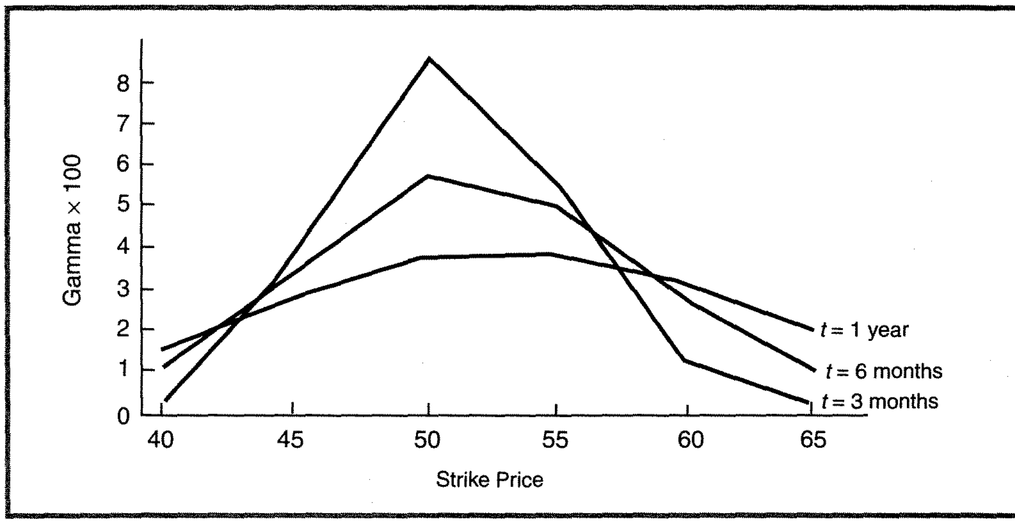


TABLE 40-4.
Gamma comparison – various amounts of time remaining (with XYZ = 50).

Time Remaining	Strike Price					
	40	45	50	55	60	65
1 year	.015	.029	.039	.04	.033	.023
6 months	.011	.037	.058	.051	.030	.013
3 months	.003	.039	.086	.057	.015	.002
2 months			.108			
1 month			.166			
1 week			.288			

Note that the at-the-money options (January 50's and February 50's) on ABC, the less volatile stock, have larger gammas than do their XYZ counterparts. However, look one strike higher (January 55's), and notice that the more volatile options have a slightly higher gamma. Look two strikes higher and the more volatile options have a vastly higher gamma, both for the January 60's and the February 60's.

This concept makes sense if one thinks about the relationship between volatility and delta. On nonvolatile stocks, one finds that the delta of even a slightly in-the-money option increases rapidly. This is because, since the stock is not volatile, buyers are not willing to pay much time premium for the option. As a result, the gamma is high as well, because as the stock moves into-the-money, the *increase* in

delta will be more dramatic than it would be for a volatile stock. Out-of-the-money options are an entirely different story. Since the nonvolatile stock will have difficulty moving fast enough to reach an out-of-the-money striking price, the delta of the out-of-the-money option is small and it will not change quickly (that is, the gamma is small also).

These concepts are summarized in Figure 40-5 (see Table 40-5), which depicts the gammas for similar options on stocks with differing volatilities. For the purposes of these graphs, XYZ is equal to 50 and there are three months remaining until expiration.

Notice that for a very volatile stock, the gamma is quite stable over nearly all striking prices when there are 3 months remaining until expiration. This means that the deltas of all options on such a volatile stock will be changing quite a bit for even a 1-point move in the underlying stock. This is an important point for neutral strategists to note, because a position that starts out as delta neutral may quickly change if the underlying stock is very volatile. As this table implies, the deltas of the options in that "neutral" spread may be altered quickly, thereby rendering the spread quite unneutral. This concept will be discussed in greater detail later in this chapter.

As delta was used to construct the equivalent stock position of an entire option position or portfolio, gamma can be used in a similar manner. An example of this follows, using the same securities from the preceding example on the delta of a position. An important point to note is that *the gamma of the underlying security itself is zero.* This is true because the *delta* of the underlying security (which is always 1.0) never changes – hence the gamma is zero. The gamma is measuring the amount of change of the delta; if the delta of the underlying security never changes, the gamma of the underlying security must be zero.

Example: The following position exists when XYZ is at 31.75. Recall that it resembles a long straddle (or backspread) in that there is increased profit potential in either direction if the stock moves far enough by expiration. In addition to the delta previously listed, the gamma is now shown as well. Note that since gamma is a small absolute number, it is sometimes calculated out to three or four decimal places.

Position	Option Delta	Position Delta	Option Gamma	Position Gamma
Short 4,500 XYZ	1.00	– 4,500	0.0000	0
Short 100 XYZ April 25 calls	0.89	– 8,900	0.0100	–100
Long 50 XYZ April 30 calls	0.76	+ 3,800	0.0300	+150
Long 139 XYZ July 30 calls	0.74	+10,286	0.0200	+278
Totals:		+ 686		+328

FIGURE 40-5.
Gamma comparison, with XYZ = 50, t = three months.

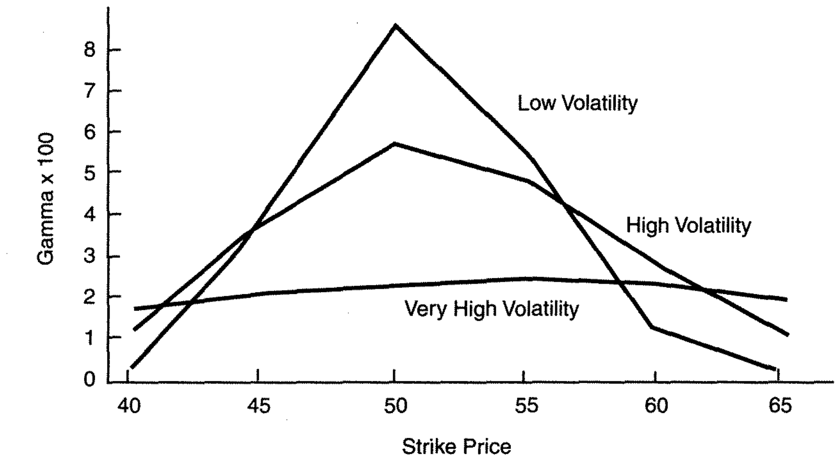


TABLE 40-5.
Gamma comparison for varying volatilities (XYZ = 50, t = 3 months).

Strike	Low Volatility	Gamma High Volatility	Very High Volatility
40	.003	.013	.017
45	.039	.039	.022
50	.086	.057	.024
55	.057	.049	.025
60	.015	.028	.023
65	.002	.012	.020

As before, the position still has a delta long of almost 700 shares. In addition, one can now see that it has a *positive gamma* of over 300 shares. This means that the delta can be expected to change by 328 shares for each point that XYZ moves: If it moves up 1 point, the delta will increase to +1,014 (the current delta, 686, plus the gamma of 328). However, if XYZ moves down by 1 point, then the delta will decrease to +358 (the current delta, 686, less the gamma of 328).

Note that, in the above example, if XYZ continues higher, the gamma will remain positive (although it will eventually shrink some), and the delta will continue to increase. This means the position is getting longer and longer – a fact that makes

sense when one notes that there are extra long calls and they would be getting deeper in-the-money as the stock moves up. Conversely, if XYZ continues to move lower, the delta will continue to decrease and will quickly become negative, meaning that the position would become short overall. Hence, the position does indeed resemble a long straddle: It gets longer as the market moves up and it gets shorter as the market moves down.

Long options, whether puts or calls, have positive gamma, while short options have negative gamma. Thus, a strategist with a position that has positive gamma has a net long option position and is generally hoping for large market movements. Conversely, if one has a position with negative gamma, it means he has shorted options and wants the market to remain fairly stable.

Note that it is possible to be delta neutral, but to have a significant gamma. (For example, if one owns puts and calls with offsetting deltas, he would be delta neutral, but would have positive gamma since both options are long.) If one is delta neutral, he knows he has no market exposure at this time, but his gamma will show him what exposure his position will acquire as the market moves. These concepts will be discussed in greater detail later in this chapter.

VEGA OR TAU

There is no letter in the Greek alphabet called "vega." Thus, some strategists, being purists, prefer to use a real Greek letter, "tau," to refer to this risk measurement. The term "vega" will be used in this book, but the reader should note that "tau" means the same thing. *Vega is the amount by which the option price changes when the volatility changes.* Vega is always expressed as a positive number, whether it refers to a put or a call.

It is known that more volatile stocks have more expensive options. Thus, as volatility increases, the price of an option will rise. If volatility falls, the price of the option will fall as well. The vega is merely an attempt to quantify how much the option price will increase or decrease as the volatility moves, all other factors being equal.

Before considering an example, a review of the term *volatility* is in order. Volatility is a measure of how quickly the underlying security moves around. Statistically, it is usually calculated as the standard deviation of stock prices over some period of time, generally annualized. This statistical measure is expressed as a percent, although relating that percent to actual stock movements can be complicated. Suffice it to say that a stock that has a 50% volatility is more volatile than a stock with 30% volatility. The stock market generally has a volatility of about 15% overall, although that may change from time to time (crashes, for example).

Example: Again, assume XYZ is at 49, and the January 50 call is selling for 3.50. The vega of the option is 0.25, and the current volatility of XYZ is 30%.

If the volatility increases by one percentage point or 1% to 31%, then the vega indicates that the option will increase in value by 0.25, to 3.75.

If the volatility had instead decreased by 1 percent to 29%, then the January 50 call would have decreased to 3.25 (a loss of 0.25, the amount of the vega).

If the implied volatility of an option increases, the option price will increase as well. Consequently, even though XYZ stock may be exhibiting the same historic movement that it always has, and therefore its (historical) volatility would be unchanged, if option buyers appear in sufficient quantity, they may drive the implied volatility of XYZ's options higher. Likewise, an excess of option sellers could drive the implied volatility lower, even though the historical volatility does not change. So, it must be concluded that *vega measures how much the option price changes as implied volatility changes.*

Vega is related to time. Figure 40-6 (see Table 40-6) shows the vegas for options with differing times remaining until expiration. The underlying stock is assumed to be 50 in all cases. Notice that the more time that remains, the higher the vega is. It is interesting to note that, for very long-term options, the vega of the slightly out-of-the-money calls (strike = 55) is actually higher than that of the at-the-money. However, this discrepancy disappears as time passes. Not shown, but equally true, is that the vega of a slightly out-of-the-money option on a very volatile stock may be higher than that of the at-the-money.

As with the measurements of risk discussed already, vega can refer to the option itself ("option vega") or to the position as a whole ("position vega"). Since vega is expressed as a positive number, if one is long options, then his position vega will be positive. This means he has exposure if volatilities decrease, or can make money if volatilities increase.

Example: Again, assume that we have the same backspread position as before, with XYZ at 31.75.

Position	Option Vega	Position Vega
Short 4,500 XYZ	0.00	0
Short 100 XYZ April 25 calls	0.02	− 200
Long 50 XYZ April 30 calls	0.05	+ 250
Long 139 XYZ July 30 calls	0.07	+ 973
Total Vega:		+1,023

FIGURE 40-6.
Vega comparison, XYZ = 50.

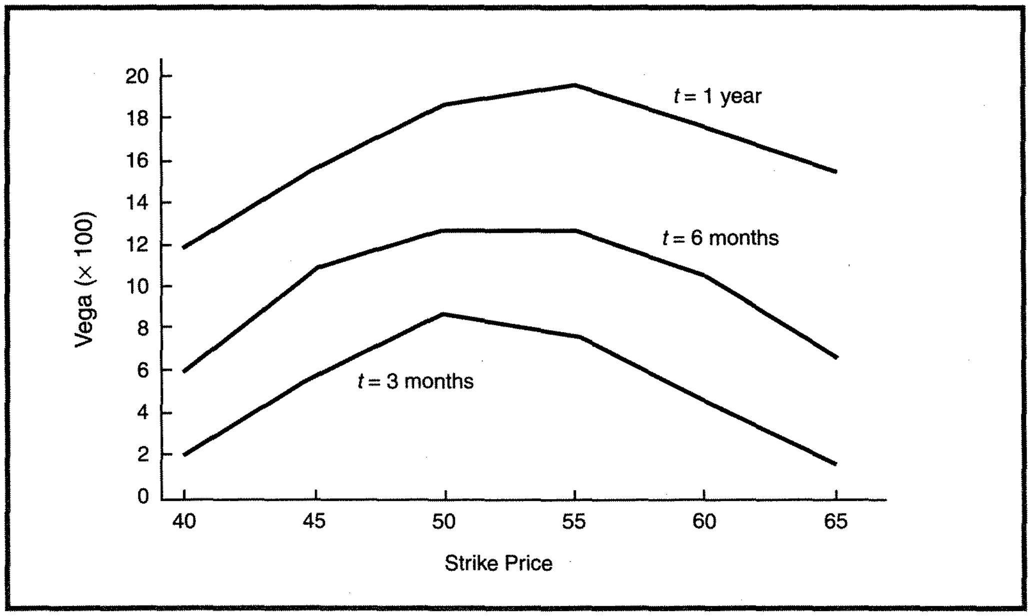


TABLE 40-6.
Vega comparison for different time periods (with XYZ = 50).

	Vega		
Strike Price	t = 1 Year	t = 6 Months	t = 3 Months
40	0.12	0.06	0.02
45	0.16	0.11	0.06
50	0.19	0.13	0.09
55	0.20	0.13	0.08
60	0.18	0.11	0.05
65	0.16	0.07	0.02

The vega is a positive 10.23 points ($1,023 since each point for these equity options is worth $100). The fact that the position has a positive vega means that it is exposed to variations in volatility. If volatility decreases, the position will lose money: $1,023 for each one percentage point decrease in volatility. However, if volatility increases, the position will benefit.

Vega is greatest for at-the-money options and approaches zero as the option is deeply in- or out-of-the-money. Again, this is common sense, since a deep in- or out-

Example: Again, assume XYZ is at 49, and the January 50 call is selling for 3.50. The vega of the option is 0.25, and the current volatility of XYZ is 30%.

If the volatility increases by one percentage point or 1% to 31%, then the vega indicates that the option will increase in value by 0.25, to 3.75.

If the volatility had instead decreased by 1 percent to 29%, then the January 50 call would have decreased to 3.25 (a loss of 0.25, the amount of the vega).

If the implied volatility of an option increases, the option price will increase as well. Consequently, even though XYZ stock may be exhibiting the same historic movement that it always has, and therefore its (historical) volatility would be unchanged, if option buyers appear in sufficient quantity, they may drive the implied volatility of XYZ's options higher. Likewise, an excess of option sellers could drive the implied volatility lower, even though the historical volatility does not change. So, it must be concluded that *vega measures how much the option price changes as implied volatility changes.*

Vega is related to time. Figure 40-6 (see Table 40-6) shows the vegas for options with differing times remaining until expiration. The underlying stock is assumed to be 50 in all cases. Notice that the more time that remains, the higher the vega is. It is interesting to note that, for very long-term options, the vega of the slightly out-of-the-money calls (strike = 55) is actually higher than that of the at-the-money. However, this discrepancy disappears as time passes. Not shown, but equally true, is that the vega of a slightly out-of-the-money option on a very volatile stock may be higher than that of the at-the-money.

As with the measurements of risk discussed already, vega can refer to the option itself ("option vega") or to the position as a whole ("position vega"). Since vega is expressed as a positive number, if one is long options, then his position vega will be positive. This means he has exposure if volatilities decrease, or can make money if volatilities increase.

Example: Again, assume that we have the same backspread position as before, with XYZ at 31.75.

Position	Option Vega	Position Vega
Short 4,500 XYZ	0.00	0
Short 100 XYZ April 25 calls	0.02	− 200
Long 50 XYZ April 30 calls	0.05	+ 250
Long 139 XYZ July 30 calls	0.07	+ 973
Total Vega:		+1,023

FIGURE 40-6.
Vega comparison, XYZ = 50.

TABLE 40-6.
Vega comparison for different time periods (with XYZ = 50).

	Vega		
Strike Price	t = 1 Year	t = 6 Months	t = 3 Months
40	0.12	0.06	0.02
45	0.16	0.11	0.06
50	0.19	0.13	0.09
55	0.20	0.13	0.08
60	0.18	0.11	0.05
65	0.16	0.07	0.02

The vega is a positive 10.23 points ($1,023 since each point for these equity options is worth $100). The fact that the position has a positive vega means that it is exposed to variations in volatility. If volatility decreases, the position will lose money: $1,023 for each one percentage point decrease in volatility. However, if volatility increases, the position will benefit.

Vega is greatest for at-the-money options and approaches zero as the option is deeply in- or out-of-the-money. Again, this is common sense, since a deep in- or out-

of-the-money option will not be affected much by a change in volatility. In addition, for at-the-money options, longer-term options have a higher vega than short-term options. To verify this, think of it in the extreme: An at-the-money option with one day to expiration will not be overly affected by any change in volatility, due to its pending expiration. However, a three-month at-the-money option will certainly be sensitive to changes in volatility.

Vega does not directly correlate with either delta or gamma. One could have a position with no delta and no gamma (delta neutral and gamma neutral) and still have exposure to volatility. This does not mean that such a position would be undesirable; it merely means that if one had such a position, he would have removed most of the market risk from his position and would be concerned only with volatility risk.

In later sections, the use of volatility to establish positions and the use of vega to monitor them will be discussed.

THETA

Theta measures the time decay of a position. All option traders know that time is the enemy of the option holder, and it is the friend of the option writer. Theta is the name given to the risk measurement of time in one's position. Theta is generally expressed as a negative number, and it is expressed as the amount by which the option value will change. Thus, if an option has a theta of –0.12, that means the option will lose 12 cents, or about an eighth of a point, *per day.* This is true for both puts and calls, although the theta of a put and a call with the same strike and expiration date are not equal to each other.

Very long-term options are not subject to much time decay in one day's time. Thus, the theta of a long-term option is nearly zero. On the other hand, short-term options, especially at-the-money ones, have the largest absolute theta, since they are subject to the ravages of time on a daily basis. The theta of options on a highly volatile stock will be higher than the theta of options on a low-volatility stock. Obviously, the former options are more expensive (have more time value) and therefore have more time value to lose on a daily basis, thereby implying that they have a higher theta. Finally, the decay is not linear – an option will lose a greater percent of its daily value near the end of its life.

Figure 40-7 (see Table 40-7) depicts the relationships of thetas for various striking prices and for differing volatilities on options with three months of life remaining. Again, notice that for very volatile stocks, the out-of-the-money options have thetas as large as the at-the-moneys. This is saying that as each day passes, the probability of the stock reaching that out-of-the-money strike drops and causes the option

FIGURE 40-7.
Theta comparison, with XYZ = 50, t = three months.

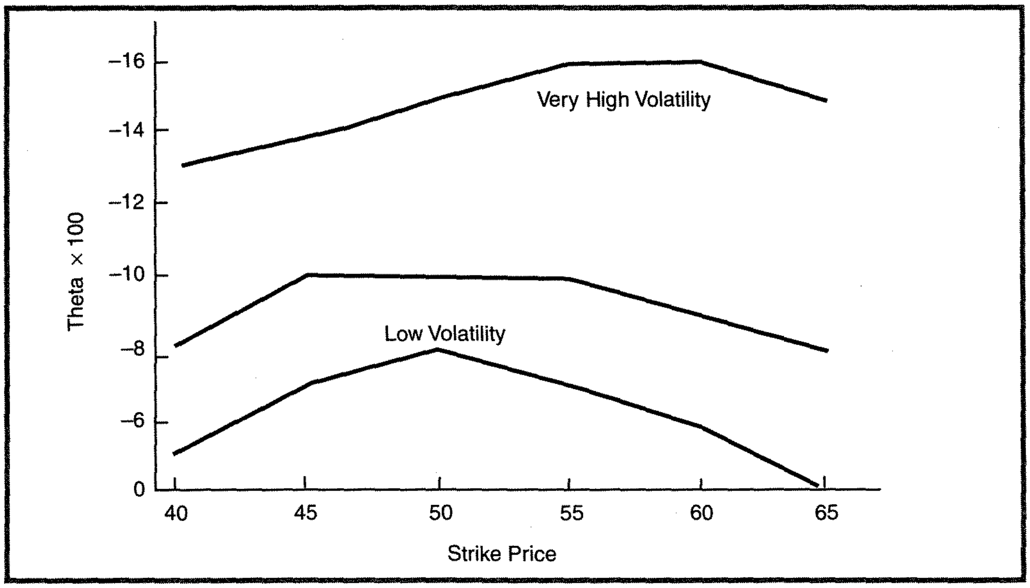


TABLE 40-7.
Theta comparison for differing volatilities (XYZ = 50, t = 3 months).

Strike	Low Volatility	Medium Volatility	High Volatility
40	−0.005	−0.008	−0.013
45	−0.007	−0.010	−0.014
50	−0.008	−0.010	−0.015
55	−0.007	−0.010	−0.016
60	−0.006	−0.009	−0.016
65	−0.004	−0.008	−0.015

to lose value. This does not change the fact that, for very short-term options, the theta is largest at-the-money.

Normally, the theta of an individual option is of little interest to the strategist. He generally would be more concerned with delta or gamma. However, as with the other risk measures, theta can be computed for an entire portfolio of options. This measure, the "position theta," can be quite important because it gives the strategist a good idea of how much gain or loss he can expect on a daily basis, due to time erosion. The following example demonstrates this point. Note that the underlying security itself has a theta of zero, since it cannot lose any value due to time decay.

Example: With XYZ at 49, the strategist has the following position in February, so that the April calls are nearer to expiration than the July calls. This position is similar to a large calendar spread position.

Position	Option Theta	Position Theta
Short 4,000 XYZ	0.00	0
Short 150 XYZ April 50 calls	– 0.04	+ 600
Long 150 XYZ April 30 calls	– 0.02	– 300
Short 78 XYZ July 30 puts	– 0.02	+ 156
Total Theta:		+ 456

This position is expected to make $456 per day due to time decay. Note that *short options, whether puts or calls, have a positive position theta, while long options have a negative position theta.* A negative position theta means the position has risk due to time, while a positive position theta means time is working for the position.

RHO

Rho is the name given to the *price change of an option's value due to a change in interest rates.* Recall that one of the components that contributes to an option's price is interest rates. *As interest rates rise, call prices will rise, but put prices will fall. The opposite is true as well: As interest rates fall, call prices decline and put prices rise.* Rho measures the amount by which these prices rise or fall.

This behavior of puts and calls with respect to interest rates may not be immediately obvious, but recall that the arbitrage that can be established with in-the-money calls (the "interest play," discussed in Chapter 27 on arbitrage) demonstrates that arbitrageurs are willing to pay more for an in-the-money call as interest rates rise because they will be earning more interest on the stock that they sell short against that in-the-money call. Thus, rising interest rates cause call prices to increase.

The opposite is true for puts: Rising interest rates cause put prices to decline. Again, an arbitrage can be used to demonstrate the point. Recall that in a reversal arbitrage, the arbitrageur is selling the stock and the put while buying the call. We have just demonstrated that, as interest rates rise, he is willing to pay more for the call since he can earn extra interest on the short sale of his stock. This automatically means that he will be willing to sell the put for less.

Rho is expressed as a positive number for calls and a negative one for puts. *Rho is smallest for deeply out-of-the-money options and is large for deeply-in-the-money options. It is larger for longer-term options and is nearly zero for very short-term*

options. The following table of option prices may help to demonstrate these relationships:

Example: With XYZ at 49, the following options have the rho indicated (January is the near-term expiration):

Month/Strike	Call Rho	Put Rho
January 35	0.05	–0.01
January 50	0.03	–0.03
January 60	0.00	–0.05
July 35	0.18	–0.02
July 50	0.14	–0.15
July 60	0.07	–0.18

Note that the in-the-money calls (35 strike) have larger rho than the out-of-the-money 60's, in both January and July. Similarly, the in-the-money puts (the 60's) have larger rho on an absolute basis than the out-of-the-money 35's. Again, this is true for both January and July.

Furthermore, note that the longer-term July rhos are all larger (again as absolute numbers) than their shorter-term January counterparts.

Rho can also be calculated for an entire portfolio to obtain a "position rho," similar to previous examples. Generally, one would not be overly concerned with his position rho unless his portfolio contained quite a few long-term options and/or deeply in-the-money ones. Thus, rho is more important as a consideration when one is trading LEAPS or warrants, both of which may be extremely long-term vehicles. Of the risk measures discussed so far, rho is the least used, since many traders tend to have relatively short-term options in their positions.

THE GAMMA OF THE GAMMA

Occasionally, one may hear reference to the "six measures of risk." This is the sixth one and it is the most arcane. At any point, one knows the delta and gamma of an option. As the stock moves, the delta changes (by the amount of the gamma), but so does the gamma. Some traders are interested in knowing how much the *gamma* will change when the stock moves. Hence, they will compute the *gamma of the gamma,* which is *the amount by which the gamma will change when the stock price changes.* This concept will be discussed at the end of this chapter. It is most important for strategists involved in positions on highly volatile stocks, for if the stock moves far

enough, the gamma (and therefore the delta) may change dramatically. Thus, one might want to know how this risk measure affects his profitability.

SUMMARY

Delta:	Positive delta indicates that a position is currently bullish; if the underlying security goes up in price, the position should make money. A negative delta indicates a bearish slant.
Gamma:	Positive gamma means that the delta will increase if the underlying security rises in price. Positive gamma generally implies that there is a preponderance of long options in the position, either puts or calls; negative gamma indicates written or naked options in the position.
Theta:	Negative theta means that the position will lose money as time passes (typical of positions with long options); positive theta implies that time is working for the position (positions with written options).
Vega:	Positive vega means that an increase of (perceived) volatility will benefit the position – usually true of positions with long options in them; negative vega means that a decrease of volatility would be beneficial.

STRATEGY CONSIDERATIONS: USING THE "GREEKS"

Before looking at how one operates a particular strategy using delta, gamma, etc., it might be beneficial to see how these factors relate to the individual strategies that have been described throughout this book. Table 40-8 is a general guide to how the various strategies are exposed to various market factors. It is not an all-purpose or specific table, because as the stock moves higher or lower, some of the risk measurement factors will certainly be affected.

A few assumptions were made in constructing the table. First, it was assumed that the strategies where delta is noted as being zero are established in a neutral stance. The bull spread and bear spread strategies assumed that the stock was midway between the striking prices. Two other spread strategies – ratio call and ratio put – assumed the stock was at the striking price of the option that was sold. In all other cases, there is only one striking price involved, and it was assumed that the stock was at the strike.

The table may help to clarify some of the concepts concerning the risk measurement factors. First, notice that stock or futures – or any underlying security – have only delta. None of the other factors pertains to the underlying security itself.

TABLE 40-8.
General risk exposure of common strategies.

Strategy	Delta	Gamma	Theta	Vega	RHo
Buy stock	+	0	0	0	0
Sell stock short	–	0	0	0	0
Call buy	+	+	–	+	+
Put buy	–	+	–	+	–
Straddle buy	0	+	–	+	+
Covered write	+	–	+	–	–
Naked call sale	–	–	+	–	–
Naked put sale	+	–	+	–	+
Ratio write (straddle sale)	0	–	+	–	–
Calendar spread	0	–	+	+	–
Bull spread	+	–	–	–	+
Bear spread	–	–	–	–	+
Ratio call spread	0	–	+	–	–
Ratio put spread	0	–	+	–	+

As might be expected, spread strategies involving both long and short options are less easily quantified than outright buys or sells. The calendar spread strategy is one in which the spreader does not want a lot of stock movement – he would prefer the underlying security to remain near the striking price, for that is the area of maximum profit potential. This is reflected by the fact that gamma is negative. Also, for calendar spreads, the passage of time is good, a fact that is reflected by the fact that theta is positive. Finally, since an increase in implied volatilities or interest rates would boost prices and widen the spread (creating a profit), vega is positive and rho is negative.

A bull spread has positive delta, reflecting the bullish nature of the spread, but it has negative gamma. The reason gamma is negative is that the position becomes less bullish as the underlying security rises, since the profit potential, and hence the bullishness of the position, is limited. For similar reasons, a bear spread has negative delta (reflecting bearishness) and negative gamma (reflecting limited bearishness). Both the bull spread and the bear spread are the same with respect to the other risk measurements: Theta is negative, reflecting the fact that time decay can hurt the spread. Less obvious is the fact that these spreads are hurt by an increase in perceived volatility; a negative vega tells us this is true, however.

These risk measurement tools are important in that they can quite graphically depict the risk and reward characteristics of an option position or option portfolio.

They are useful in establishing a new position, because one can see how much exposure he is taking on. In addition, they are extremely useful for follow-up action, since one can see how his position's characteristics have developed in the current marketplace at the present time. In the following sections, the use of the risk measurement tools as aids in establishing a position or in following up on a position will be discussed in detail.

DELTA NEUTRAL

One popular type of neutral position is to be *delta neutral* – that is, to have the equivalent stock position (ESP) or equivalent futures position (EFP) be zero. *A delta neutral position is one in which the sum of the projected price changes of the long options in the spread is essentially offset by the projected price changes of the short options in the same spread.*

Example: XYZ is trading at 50. The following three options are trading with the prices and deltas indicated. Furthermore, the "theoretical value" of each option is shown:

XYZ: 50

Option	Price	Delta	"Theoretical Value"
January 50 call	3.00	0.55	3.50
January 55 call	1.50	0.35	1.48
February 50 put	3.50	−0.40	3.44

Assuming that one can rely upon these "theoretical values" (a big assumption, by the way), it is obvious that the January 50 call is cheap with respect to the other options: They are close to their values, while the January 50 is 50 cents under. The neutral strategist would want to buy the January 50 call and hedge his purchase with one of the other two options presented. One choice would be to establish a spread wherein the January 50 calls are bought and a number of January 55's are sold. To determine how many are to be bought and sold, one merely has to divide the deltas of the two options:

$$\text{Delta neutral spread ratio} = 0.55/0.35 = 11\text{-to-}7$$

Thus, a delta neutral ratio spread would consist of buying 7 January 50's and selling 11 January 55's. To verify that this spread is neutral with respect to the change in price of XYZ, notice that if XYZ moves up in price 1 point, the January 50 will increase

in price by 0.55; so seven of them will increase by 7 × 0.55, or 3.85 points total. Similarly, the January 55 will increase in price by 0.35, so eleven of them would increase in price by 11 × 0.35, or 3.85 points total. Hence, the long side of the spread would profit by 3.85 points, while the short side loses 3.85 points – a neutral situation.

The resulting position is a ratio spread. The profitability of the spread occurs between about 51 and 62 at expiration as shown in Figure 40-8, but that is not the major point. The real attractiveness of the spread to the neutral trader is that if the underpriced nature of the January 50 call (vis-a-vis the January 55 call) should disappear, the spread should produce a profit, regardless of the short-term market movement of XYZ. The spread could then be closed if this should occur.

To illustrate this fact, suppose that XYZ actually falls to 49, but the January 50 call returns to "fair value":

XYZ: 49

Option	Price	Delta	"Theoretical Value"
January 50 call	3.00	0.52	3.00
January 55 call	1.10	0.34	1.13
February 50 put	3.90	−0.42	3.84

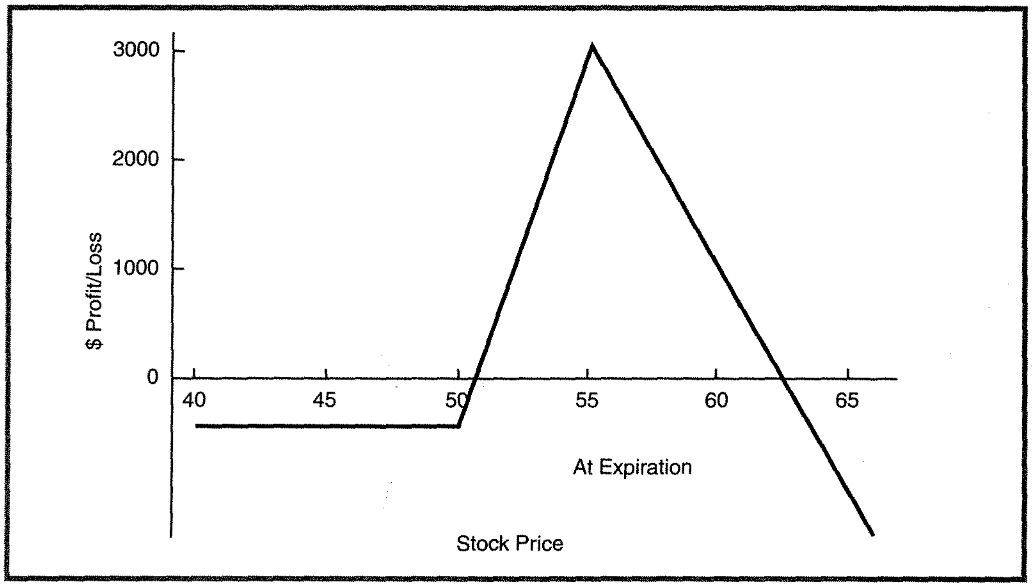
Notice that the theoretical values in this table are equal to the theoretical values from the previous table, less the amount of the delta. Since the XYZ January 50 call is no longer underpriced, the position would be removed, and the strategist would make nothing on his January 50's, but would make .40 on each of the eleven short January 55's, for a profit of $440 less commissions.

This example leans heavily on the assumption that one is able to accurately estimate the theoretical value and delta of the options. In real life, this chore can be quite difficult, since the estimate requires one to define the future volatility of the common stock. This is not easy. However, for the purposes of a spread, the ratio of the two deltas is used. Moreover, the example didn't require that one know the exact theoretical value of each option; rather, the only knowledge that was required was that one of the options was cheap with respect to the other options.

As an alternative to a ratio spread, another type of delta neutral position could be established from the previous data: Buy the January 50 call (this is the basis of the position since it is supposedly the cheap option) and buy the February 50 put – the only other choice from the data given. This position is a long straddle of sorts. Recall that the delta of a put is negative; so again, the delta neutral ratio can be calculated by dividing the absolute value of two deltas:

$$\text{Delta neutral straddle ratio} = 0.55/|-0.40| = 11\text{-to-}8$$

FIGURE 40-8.
XYZ ratio spread.

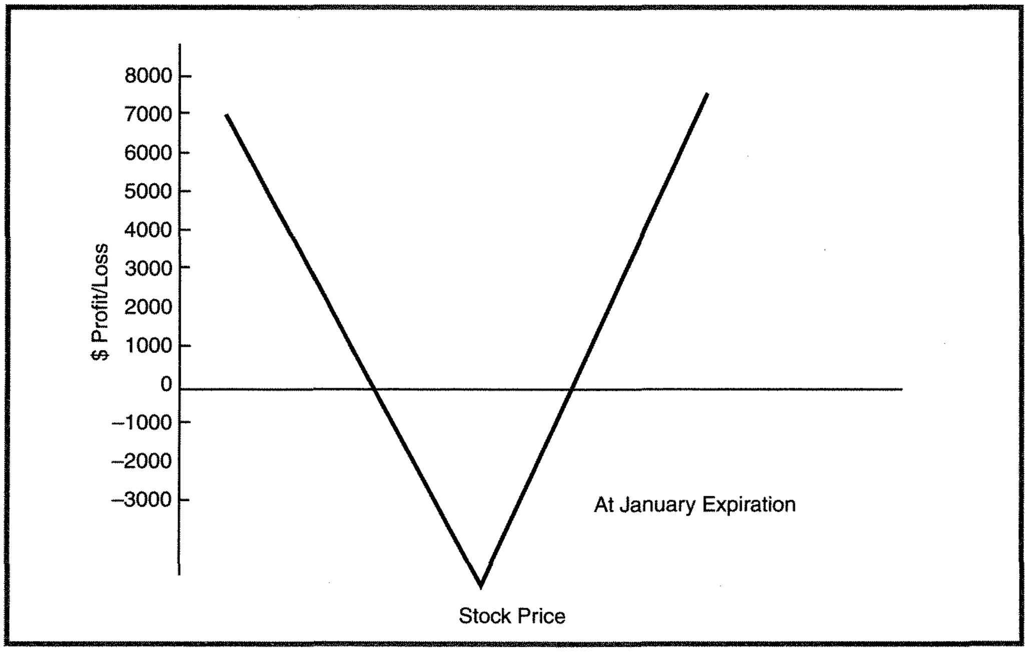


Thus, a delta neutral straddle position would consist of buying 8 January 50 calls and buying 11 February 50 puts. The straddle has no market exposure, at least over the short term. Note that the delta neutral straddle has a significantly different profit picture from the delta neutral ratio spread, but they are both neutral and are both based on the fact that the January 50 call is cheap. The straddle makes money if the stock moves a lot, while the other makes money if the stock moves only a little. (See Figure 40-9.)

Can these two vastly different profit pictures be depicting strategies in which the same thing is to be accomplished (that is, to capture the underpriced nature of the XYZ January 50 call)? Yes, but in order to decide which strategy is "best," the strategist would have to take other factors into consideration: the historical volatility of the underlying security, for example, or how much actual time remains until January expiration, as well as his own psychological attitude toward selling uncovered calls. A more precise definition of the other risks of these two positions can be obtained by looking at their position gammas.

Delta Neutral Is Not Entirely Neutral. In fact, delta neutral means that one is neutral *only with respect to small price changes in the underlying security.* A delta neutral position may have seriously unneutral characteristics when

FIGURE 40-9.
XYZ straddle buy.



some of the other risk measurements are considered. Consequently, one cannot blithely go around establishing delta neutral positions and ignoring them, for they may have significant market risk as certain factors change.

For example, it is obvious to the naked eye that the two positions described in the previous section – the ratio spread and the long straddle – are not alike at all, but both are delta neutral. If one incorporates the usage of some of the other risk measurements into his position, he will be able to quantify the differences between "neutral" strategies. The sale of a straddle will be used to examine how these various factors work.

Positions with naked options in them have negative position gamma. This means that as the underlying security moves, the position will acquire traits opposite to that movement: If the security rises, the position becomes short; if it falls, the position becomes long. This description generally fits any position with naked options, such as a ratio spread, a naked straddle, or a ratio write.

Example: XYZ is at 88. There are three months remaining until July expiration, and the volatility of XYZ is 30%. Suppose 100 July 90 straddles are sold for 10 points – the put and the call each selling for 5. Initially, this position is nearly delta neutral, as

shown in Table 40-9. However, since both options are sold, each sale places negative gamma in the position.

The usefulness of calculating gamma is shown by this example. The initial position is NET short only 100 shares of XYZ, a very small delta. In fact, a person who is a trader of small amounts of stock might actually be induced into believing that he could sell these 100 straddles, because that is equivalent to being short merely 100 shares of the stock.

TABLE 40-9.
Position delta and gamma of straddle sale. XYZ = 88.

Position	Option Delta	Position Delta	Option Gamma	Position Gamma
Sell 100 July 90 calls	0.505	−5,050	0.03	−300
Sell 100 July 90 puts	0.495	+4,950	0.03	−300
Total shares		− 100		−600

Calculating the gamma quickly dispels those notions. The gamma is large: 600 shares of negative gamma. Hence, if the stock moves only 2 points lower, this trader's straddle position can be expected to behave as if it were now long 1,100 shares (the original 100 shares short plus 1,200 that the gamma tells us we can expect to get long)! The position might look like this after the stock drops 2 points:

XYZ: 86

Position	Option Delta	Position Delta
Sold 100 July 90 calls	0.44	−4,400
Sold 100 July 90 puts	0.55	+5,500
		+1,100 shares

Hence, a 2-point drop in the stock means that the position is already acquiring a "long" look. Further drops will cause the position to become even "longer." This is certainly not a position – being short 100 straddles – for a small trader to be in, even though it might have erroneously appeared that way when one observed only the delta of the position. Paying attention to gamma more fully discloses the real risks.

In a similar manner, if the stock had *risen* 2 points to 90, the position would quickly have become delta short. In fact, one could expect it to be short 1,300 shares in that case: the original short 100 shares plus the 1,200 indicated by the negative gamma. A rise to 90, then, would make the position look like this:

XYZ: 90

Position	Option Delta	Position Delta
Sold 100 July 90 calls	0.56	−5,600
Sold 100 July 90 puts	0.43	+4,300
		−1,300 shares

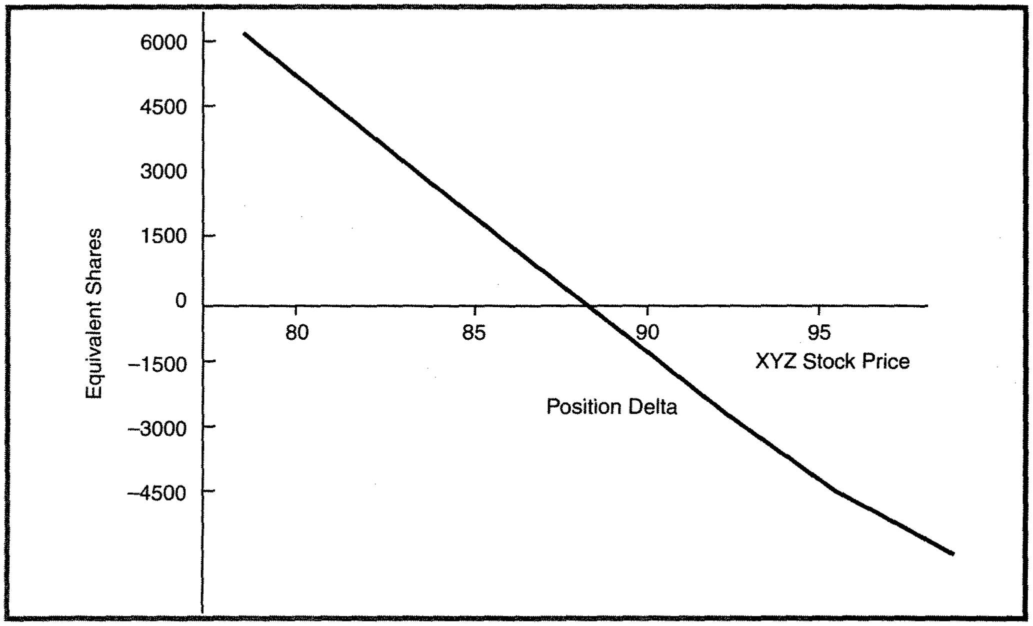
These examples demonstrate how quickly a large position, such as being short 100 straddles, can acquire a large delta as the stock moves even a small distance. Extrapolating the moves is not completely correct, because the gamma changes as the stock price changes, but it can give the trader some feel for how much his delta will change.

It is often useful to calculate this information in advance, to some point in the near future. Figure 40-10 depicts what the delta of this large short straddle position will be, two weeks after it was first sold. The points on the horizontal axis are stock prices. The quickness with which the neutrality of the position disappears is alarming. A small move up to 93 – only one standard deviation – in two weeks makes the overall position short the equivalent of about 3,300 shares of XYZ. Figure 40-10 really shows nothing more than the effect that gamma is having on the position, but it is presented in a form that may be preferable for some traders.

What this means is that the position is "fighting" the market: As the market goes up, this position becomes shorter and shorter. That can be an unpleasant situation, both from the point of view of creating unrealized losses as well as from a psychological viewpoint. *The position delta and gamma can be used to estimate the amount of unrealized loss that will occur.* Just how much can this position be expected to lose if there is a quick move in the underlying stock? The answer is quickly obtained from the delta and gamma: With the first point that XYZ moves, from 88 to 89, the position acts as if it is short 100 shares (the position delta), so it would lose $100. With the next point that XYZ rises, from 89 to 90, the position will act as if it is short the original 100 shares (the position delta), plus another 600 shares (the position gamma). Hence, during that second point of movement by XYZ, the entire position will act as if it is short 700 shares, and therefore lose another $700. Therefore, an immediate 2-point jump in XYZ will cause an unrealized loss of $800 in the position. Summarizing:

Loss, first point of stock movement = position delta
Loss, second point of stock movement = position delta + gamma
Total loss for 2 points of stock movement
= 2 × position delta + position gamma

FIGURE 40-10.
Projected delta, in 14 days.



Using the example data:
Loss, XYZ moves from 88 to 89: –$100 (the position delta)
Loss, XYZ moves from 89 to 90: –$100 (delta) – $600 (gamma)
: –$700
Total loss, XYZ moves from 88 to 90: –$100 × 2 – $600 = –$800

This can be verified by looking at the prices of the call and put after XYZ has jumped from 88 to 90. One could use a model to calculate expected prices if that happened. However, there is another way. Consider the following statements:

If the stock goes up by 1 point, the call will then have a price of:

$$p_1 = p_0 + \text{delta}$$

$$5.505 = 5.00 + 0.505 \text{ (if XYZ goes to 89 in the example)}$$

If the stock goes up 2 points, the call will have an increase of the above amount plus a similar increase for the next point of stock movement. The delta for that second point of stock movement is the original delta plus the gamma, since gamma tells one how much his delta is going to change.

$$
\begin{aligned}
p_2 &= p_1 + \text{delta} + \text{gamma, or substituting from above} \\
p_2 &= (p_0 + \text{delta}) + \text{delta} + \text{gamma} \\
&= p_0 + 2 \times \text{delta} + \text{gamma} \\
6.04 &= 5.00 + 2 \times 0.505 + 0.03 \text{ (in the example if XYZ = 90)}
\end{aligned}
$$

By the same calculation, the put in the example will be priced at 4.04 if XYZ immediately jumps to 90:

$$4.04 = 5.00 - 2 \times 0.495 + 0.03$$

So, overall, the call will have increased by 1.04, but the put will only have decreased by 0.96. The unrealized loss would then be computed as –$10,400 for the 100 calls, offset by a gain of $9,600 on the sale of 100 puts, for a net unrealized loss of $800. This verifies the result obtained above using position delta and position gamma. Again, this confirms the logical fact that a quick stock movement will cause unrealized losses in a short straddle position.

Continuing on, let us look at some of the other factors affecting the sale of this straddle. The straddle seller has time working in his favor. After the position is established, there will not be as much decay in the first two-week period as there will be when expiration draws near. The exact amount of time decay to expect can be calculated from the theta of the position:

XYZ: 88

Position	Option Theta	Position Theta
Sold 100 July 90 calls	–0.03	+$300
Sold 100 July 90 puts	–0.03	+$300
		+$600

This is how the position looked with respect to time decay when it was first established (XYZ at 88 and three months remaining until expiration). The theta of the put and the call are essentially the same, and indicate that each option is losing about 3 cents of value each day. Note that the theta is expressed as a negative number, and since these options are sold, the *position theta* is a positive number. A positive position theta means time decay is working in your favor. One could expect to make $300 per day from the sale of the 100 calls. He could expect to make another $300 per day from the sale of the 100 puts. Thus, his overall position is generating a theoretical profit from time decay of $600 per day.

The fact that the sale of a straddle generates profits from time decay is not earth-shattering. That is a well-known fact. However, the *amount* of that time decay

is quantified by using theta. Furthermore, it serves to show that this position, which is *delta* neutral, is *not* neutral with respect to the passage of time.

Finally, let us examine the position with respect to changes in volatility. This is done by calculating the position vega.

XYZ: 88

Position	Option Vega	Position Vega
Sold 100 July 90 calls	0.18	–$1,800
Sold 100 July 90 puts	0.18	–$1,800
		–$3,600

Again, this information is displayed at the time the position was established, three months to expiration, and with a volatility of 30% for XYZ. The vega is quite large. The fact that the call's vega is 0.18 means that the call price is expected to increase by 18 cents if the implied volatility of the option increases by one percentage point, from 30% to 31%. Since the position is short 100 calls, an increase of 18 cents in the price of the call would translate into a loss of $1,800. The put has a similar vega, so the overall position would lose $3,600 if the options trade with an increase in volatility of just one percentage point. Of course, the position would make $3,600 if the volatility decreased by one percentage point, to 29%.

This volatility risk, then, is the greatest risk in this short straddle position. As before, it is obvious that an increase in volatility is not good for a position with naked options in it. The use of vega quantifies this risk and shows how important it is to attempt to sell overpriced options when establishing such positions. One should not adhere to any one strategy all the time. For example, one should not always be selling naked puts. If the implied volatilities of these puts are below historical norms, such a strategy is much more likely to encounter the risk represented by the position vega. There have been several times in the recent past – mostly during market crashes – when the implied volatilities of both index and equity options have leaped tremendously. Those times were not kind to sellers of options. However, in almost every case, the implied volatility of index options was quite low before the crash occurred. Thus, any trader who was examining his vega risk would not have been inclined to sell naked options when they were historically "cheap."

In summary then, this "neutral" position is, in reality, much more complex when one considers all the other factors.

Position summary

Risk Factor	Comment
Position delta = −100	Neutral; no immediate exposure to small market movements; lose $100 for 1 point move in underlying.
Position gamma = −600	Fairly negative; position will react inversely to market movements, causing losses of $700 for second point of movement by underlying.
Position theta = +$600	Favorable; the passage of time works in the position's favor.
Position vega = −$3,600	Very negative; position is extremely subject to changes in implied volatility.

This straddle sale has only one thing guaranteed to work for it initially: time decay. (The risk factors will change as price, time, and volatility change.) Stock price movements will not be helpful, and there will always be stock price movements, so one can expect to feel the negative effect of those price changes. Volatility is the big unknown. If it decreases, the straddle seller will profit handsomely. Realistically, however, it can only decrease by a limited amount. If it increases, very bad things will happen to the profitability of the position. Even worse, if the implied volatility is increasing, there is a fairly likely chance that the underlying stock will be jumping around quite a bit as well. That isn't good either. *Thus, it is imperative that the straddle seller engage in the strategy only when there is a reasonable expectation that volatilities are high and can be expected to decrease.* If there is significant danger of the opposite occurring, the strategy should be avoided.

If volatility remains relatively stable, one can anticipate what effects the passage of time will have on the position. The delta will not change much, since the options are nearly at-the-money. However, the gamma will increase, indicating that nearer to expiration, short-term price movements will have more exaggerated effects on the unrealized profits of the position. The theta will grow even more, indicating that time will be an even better friend for the straddle writer. Shorter-term options tend to decay at a faster rate than do longer-term ones. Finally, the vega will decrease some as well, so that the effect of an increase in implied volatility alone will not be as damaging to the position when there is significantly less time remaining. So, the passage

of time generally will improve most aspects of this naked straddle sale. However, that does not mitigate the current situation, nor does it imply that there will be no risk if a little time passes.

The type of analysis shown in the preceding examples gives a much more in-depth look than merely envisioning the straddle sale as being delta short 100 shares or looking at how the position will do at expiration. In the previous example, it is known that the straddle writer will profit if XYZ is between 80 and 100 in three months, at expiration. However, what might happen in the interim is another matter entirely. The delta, gamma, theta, and vega are useful for the purpose of defining how the position will behave or misbehave at the current point in time.

Refer back to the table of strategies at the beginning of this section. Notice that ratio writing or straddle selling (they are equivalent strategies) have the characteristics that have been described in detail: Delta is 0, and several other factors are negative. It has been shown how those negative factors translate into potential profits or losses. Observing other lines in the same table, note that covered writing and naked put selling (they are also equivalent, don't forget) have a description very similar to straddle selling: Delta is positive, and the other factors are negative. This is a worse situation than selling naked straddles, for it entails all the same risks, but in addition will suffer losses on immediate downward moves by the underlying stock. The point to be made here is that if one felt that straddle selling is not a particularly attractive strategy after he had observed these examples, he then should feel even less inclined to do covered writing, for it has all the same risk factors and isn't even delta neutral.

An example that was given in the chapter on futures options trading will be expanded as promised at this time. To review, one may often find volatility skewing in futures options, but it was noted that one should not normally buy an at-the-money call (the cheapest one) and sell a large quantity of out-of-the-money calls just because that looks like the biggest theoretical advantage. The following example was given. It will now be expanded to include the concept of gamma.

Example: Heavy volatility skewing exists in the prices of January soybean options: The out-of-the-money calls are much more expensive than the at-the-money calls.

The following data is known:

January soybeans: 583

Option	Price	Implied Volatility	Delta	Gamma
575 call	19.50	15%	0.55	.0100
675 call	2.25	23%	0.09	.0026

Using deltas, the following spread appears to be neutral:

Buy 1 January bean 575 call at 19.50	19.50 DB
Sell 6 January bean 675 calls at 2.25	13.50 CR
Net position:	6 Debit

At the time the original example was presented, it was demonstrated through the use of the profit picture that the ratio was too steep and problems could result in a large rally.

Now that one has the concept of gamma at his disposal, he can quantify what those problems are.

The position gamma of this spread is quite negative:

$$\text{Position gamma} = .01 - 6 \times .0026 = -0.0056$$

That is, for every 10 points that January soybeans rally, the position will become short about 1/2 of one futures contract. The maximum profit point, 675, is 92 points above the current price of 583. While beans would not normally rally 92 points in only a few days, it does demonstrate that this position could become very short if beans quickly rallied to the point of maximum profit potential. Rest assured there would be no profit if that happened.

Even a small rally of 20 cents (points) in soybeans – less than the daily limit – would begin to make this tiny spread noticeably short. If one had established the spread in some quantity, say buying 100 and selling 600, he could become seriously short very fast.

A neutral spreader would not use such a large ratio in this spread. Rather, he would neutralize the gamma and then attempt to deal with the resulting delta. The next section deals with ways to accomplish that.

CREATING MULTIFACETED NEUTRALITY

So what is the strategist to do? He can attempt to construct positions that are neutral with respect to the other factors if he perceives them as a risk. There is no reason why a position cannot be constructed as vega neutral rather than delta neutral, if he wants to eliminate the risk of volatility increases or decreases. Or, maybe he wants to eliminate the risk of stock price movements, in which case he would attempt to be gamma neutral as well as delta neutral.

This seems like a simple concept until one first attempts to establish a position that is neutral with respect to more than one risk variable. For example, if one is

attempting to create a spread that is neutral with respect to both gamma and delta, he could attempt it in the following way:

Example: XYZ is 60. A spreader wants to establish a spread that is neutral with respect to both gamma and delta, using the following prices:

Option	Delta	Gamma
October 60 call	0.60	0.050
October 70 call	0.25	0.025

The secret to determining a spread that is neutral with respect to both risk measures is to neutralize gamma first, for delta can always be neutralized by taking an offsetting position in the underlying security, whether it be stock or futures. First, determine a *gamma* neutral spread by dividing the two gammas:

Gamma neutral ratio = 0.050/0.025 = 2-to-1

So, buying one October 60 and selling two October 70 calls would be a gamma neutral spread. Now, the position delta of that spread is computed:

Position	Delta	Position Delta
Long 1 October 60 call	0.60	+60 shares
Short 2 October 70 calls	0.25	–50 shares
Net position delta:		+10 shares

Hence, this gamma neutral ratio is making the position delta long by 10 shares of stock for each 1-by-2 spread that is established. For example, if one bought 100 October 60 calls and sold 200 October 70 calls, his position delta would be long 1,000 shares.

This position delta is easily neutralized by selling short 1,000 shares of the stock. The resulting position is both gamma neutral and delta neutral:

Position	Option Delta	Position Delta	Option Gamma	Position Gamma
Short 1,000 XYZ	1.00	–1,000	0	0
Long 100 October 60 calls	0.60	+6,000	0.050	+ 500
Short 200 October 70 calls	0.25	–5,000	0.025	– 500
Net Position:		0		0

Hence, it is always a simple matter to create a position that is both gamma and delta neutral. In fact, it is just as simple to create a position that is neutral with respect to delta and any other risk measure, because all that is necessary is to create a neutral ratio of the other risk measure (gamma, vega, theta, etc.) and then eliminate the resulting position delta by using the underlying.

In theory, one could construct a position that was neutral with respect to all five risk measures (or six, if you really want to go overboard and include "gamma of the gamma" as well). Of course, there wouldn't be much profit potential in such a position, either. But such constructions are actually employed, or at least attempted, by traders such as market-makers who try to make their profits from the difference between the bid and offer of an option quote, and not from assuming market risk.

Still, the concept of being neutral with respect to more than one risk factor is a valid one. In fact, if a strategist can determine what he is really attempting to accomplish, he can often negate other factors and construct a position designed to accomplish exactly what he wants. Suppose that one thought the implied volatility of a certain set of options was too high. He could just sell straddles and attempt to capture that volatility. However, he is then exposed to movements by the underlying stock. He would be better served to construct a position with negative vega to reflect his expectation on volatility, but then also have the position be delta neutral and gamma neutral, so that there would be little risk to the position from market movements. This can normally be done quite easily. An example will demonstrate how.

Example: XYZ is 48. There are three months to expiration, and the volatility of XYZ and its options is 35%. The following information is also known:

XYZ: 48

Option	Price	Delta	Gamma	Vega
April 50 call	2.50	0.47	0.045	0.08
April 60 call	1.00	0.17	0.026	0.06

For whatever reasons – perhaps the historical volatility is much lower – the strategist decides that he wants to sell volatility. That is, he wants to have a negative position vega so that when the volatility decreases, he will make money. This can probably be accomplished by buying some April 50 calls and selling more April 60 calls. However, he does not want any risk of price movement, so some analysis must be done.

First, he should determine a *gamma* neutral spread. This is done in much the same manner as determining a delta neutral spread, except that gamma is used.

Merely divide the two gammas to determine the neutral ratio to be used. In this case, assume that the April 50 call and the April 60 call are to be used:

Gamma neutral ratio: 0.045/0.026 = 1.73-to-1

Thus, a gamma neutral position would be created by buying 100 April 50's and selling 173 April 60's. Alternatively, buying 10 and selling 17 would be close to gamma neutral as well. The larger position will be used for the remainder of this example.

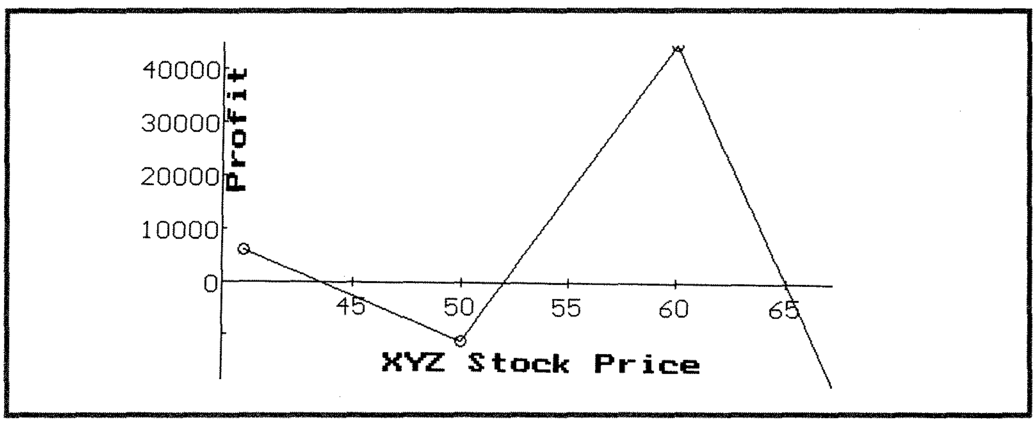
Now that this ratio has been chosen, what is the effect on delta and vega?

Position	Option Delta	Position Delta	Option Gamma	Position Gamma	Option Vega	Position Vega
Long 100 April 50	0.47	+4,700	0.045	+450	0.08	+ $800
Short 173 April 60	0.17	−2,941	0.026	−450	0.06	−1,038
Total:		+1,759		0		− $238

The position delta is long 1,759 shares of XYZ. This can easily be "cured" by shorting 1,700 or 1,800 shares of XYZ to neutralize the delta. Consequently, the complete position, including the short 1,700 shares, would be neutral with respect to both delta and gamma, and would have the desired negative vega.

The actual profit picture at expiration is shown in Figure 40-11. Bear in mind, however, that the strategist would normally not intend to hold a position like this until expiration. He would close it out if his expectations on volatility decline were fulfilled (or proved false).

FIGURE 40-11.
Spread with negative vega; gamma and delta neutral.



One other point should be made: The fact that gamma and delta are neutral to begin with does not mean that they will remain neutral indefinitely as the stock moves (or even as volatility changes). However, there will be little or no effect of stock price movements on the position in the short run.

In summary, then, one can always create a position that is neutral with respect to both gamma and delta by first choosing a ratio that makes the gamma zero, and then using a position in the underlying security to neutralize the delta that is created by the chosen ratio. This type of position would always involve two options and some stock. The resulting position will not necessarily be neutral with respect to the other risk factors.

THE MATHEMATICAL APPROACH

The strategist should be aware that the process of determining neutrality in several of the risk variables can be handled quite easily by a computer. All that is required is to solve a series of simultaneous equations.

In the preceding example, the resulting vega was negative: –$238. For each decline of 1 percentage point in volatility from the current level of 35%, one could expect to make $238. This result could have been reached by another method, as long as one were willing to spell out in advance the amount of vega risk he wants to accept. Then, he can also assume the gamma is zero and solve for the quantity of options to trade in the spread. The delta would be neutralized, as above, by using the common stock.

Example: Prices are the same as in the preceding example. XYZ is 48. There are three months to expiration, and the volatility of XYZ and its options is 35%. The following information is also the same:

Option	Price	Delta	Gamma	Vega
April 50 call	2.50	0.47	0.045	0.08
April 60 call	1.01	0.17	0.026	0.06

A spreader expects volatility to decline and is willing to set up a position whereby he will profit by $250 for each one percentage decrease in volatility. Moreover, he wants to be gamma and delta neutral. He knows that he can eventually neutralize any delta by using XYZ common stock, as in the previous example. How many options should be spread to achieve the desired result?

To answer the question, one must create two equations in two unknowns, x and y. The unknowns represent the quantities of options to be bought and sold, respectively. The constants in the equations are taken from the table above.

The first equation represents gamma neutral:

$$0.045\ x + 0.026\ y = 0,$$

where

x is the number of April 50's in the spread and y is the number of April 60's. Note that the constants in the equation are the gammas of the two calls involved.

The second equation represents the desired vega risk of making 2.5 points, or \$250, if the volatility decreases:

$$0.08\ x + 0.06\ y = -\ 2.5,$$

where

x and y are the same quantities as in the first equation, and the constants in this equation are the gammas of the options. Furthermore, note that the vega risk is negative, since the spreader wants to profit if volatility decreases.

Solving the two equations in two unknowns by algebraic methods yields the following results:

Equations:

$$0.045\ x + 0.026\ y = 0$$
$$0.08\ x + 0.06\ y = -\ 2.5$$

Solutions:

$$x = 104.80$$
$$y = -\ 181.45$$

This means that one would buy 105 April 50 calls, since x being positive means that the options would be bought. He would also sell 181 April 60 calls (y is negative, which implies that the calls would be sold). This is nearly the same ratio determined in the previous example. The quantities are slightly higher, since the vega here is –\$250 instead of the –\$238 achieved in the previous example.

Finally, one would again determine the amount of stock to buy or sell to neutralize the delta by computing the position delta:

$$\text{Position delta} = 105 \times 0.47 - 181 \times 0.17 = 18.58$$

Thus 1,858 shares of XYZ would be shorted to neutralize the position.

Note: All the equations cannot be set equal to zero, or the solution will be all zeros. This is easily handled by setting at least one equation equal to a small, nonzero quantity, such as 0.1. *As long as at least one of the risk factors is nonzero, one can determine the neutral ratio for all other factors merely by solving these simultaneous equations.* There are plenty of low-cost computer programs that can solve simultaneous equations such as these.

This concept can be carried to greater lengths in order to determine the best spread to create in order to achieve the desired results. One might even try to use three different options, using the third option to neutralize delta, so that he wouldn't have to neutralize with stock. The third equation would use deltas as constants and would be set to equal zero, representing delta neutral. Solving this would require solving three equations in three unknowns, a simple matter for a computer.

As long as at least one of the risk factors is nonzero, one can determine the neutral ratio for all other factors merely by solving these simultaneous equations. Even more importantly, the computer can scan many combinations of options that produce a position that is both gamma and delta neutral and has a specific position vega (–$238, for example). One would then choose the "best" spread of the available possibilities by logical methods including, if possible, choosing one with positive theta, so time is working in his favor.

To summarize, one can neutralize all variables, or he can specify the risk that he wants to accept in any of them. Merely write the equations and solve them. It is best to use a computer to do this, but the fact that it can be done adds an entirely new, broad dimension to option spreading and risk-reducing strategies.

EVALUATING A POSITION USING THE RISK MEASURES

The previous sections have dealt with establishing a new position and determining its neutrality or lack thereof. However, the most important use of these risk measures is to predict how a position will perform into the future. At a minimum, a serious strategist should use a computer to print out a projection of the profits and losses and position risk at future expected prices. Moreover, this type of analysis should be done for several future times in order to give the strategist an idea of how the passage of time and the resultant larger movements by the underlying security would affect the position.

First, one would choose an appropriate time period – say, 7 days hence – for the first analysis. Then he should use the statistical projection of stock prices (see Chapter 28 on mathematical applications) to determine probable prices for the underlying security at that time. Obviously, this stock price projection needs to use volatility, and

that is somewhat variable. But, for the purposes of such a projection, it is acceptable to use the current volatility. The results of as many as 9 stock prices might be displayed: every one-half standard deviation from –2 through + 2 (–2.0, –1.5, –1.0, –0.5, 0, 0.5, 1.0, 1.5, 2.0).

Example: XYZ is at 60 and has a volatility of 35%. A distribution of stock prices 7 days into the future would be determined using the equation:

$$\text{Future Price} = \text{Current Price} \times e^{av\sqrt{t}}$$

where
a corresponds to the constants in the following table: (–2.0 ... 2.0):

# Standard Deviations	Projected Stock Price
-2.0	54.46
-1.5	55.79
-1.0	57.16
-0.5	58.56
0	60.00
0.5	61.47
1.0	62.98
1.5	64.52
2.0	66.11

Again, refer to Chapter 28 on mathematical applications for a more in-depth discussion of this price determination equation.

Note that the formula used to project prices has time as one of its components. This means that as we look further out in time, the range of possible stock prices will expand – a necessary and logical component of this analysis. For example, if the prices were being determined 14 days into the future, the range of prices would be from 52.31 to 68.82. That is, XYZ has the same probability of being at 54.46 in 7 days that it has of being at 52.31 in 14 days. At expiration, some 90 days hence, the range would be quite a bit wider still. *Do not make the mistake of trying to evaluate the position at the same prices for each time period (7 days, 14 days, 1 month, expiration, etc.).* Such an analysis would be wrong.

Once the appropriate stock prices have been determined, the following quantities would be calculated for each stock price: profit or loss, position delta, position gamma, position theta, and position vega. (Position rho is generally a less important risk measure for stock and futures short-term options.) Armed with this information, the strategist can be prepared to face the future. An important item to note: A model

will necessarily be used to make these projections. As was shown earlier, if there is a distortion in the current implied volatilities of the options involved in the position, *the strategist should use the current implieds as input to the model for future option price projections.* If he does not, the position may look overly attractive if expensive options are being sold or cheap ones are being bought. A truer profit picture is obtained by propagating the current implied volatility structure into the near future.

Using an example similar to the previous one – a ratio spread using short stock to make it delta neutral – the concepts will be described.

Initial Position. XYZ is at 60. The January 70 calls, which have three months until expiration, are expensive with respect to the January 60 calls. A strategist expects this discrepancy to disappear when the implied volatility of XYZ options decreases. He therefore established the following position, which is both gamma and delta neutral.

Position	Delta	Gamma	Theta	Vega
Long 100 January 60 calls	0.57	0.0723	–0.020	0.109
Short 240 January 70 calls	0.20	0.0298	–0.019	0.080
Short 800 XYZ				

The risk measures for the entire position are:

Position delta: –38 shares (virtually delta neutral)
Position gamma: + 7 shares (gamma neutral)
Position theta: + $263
Position vega: –$827

Thus, the position is both gamma and delta neutral. Moreover, it has the attractive feature of making $263 per day because of the positive theta. Finally, as was the intention of the spreader, it will make money if the volatility of XYZ declines: $827 for each percentage point decrease in implied volatility. Two equations in two unknowns (gamma and vega) were solved to obtain the quantities to buy and sell. The resulting position delta was neutralized by selling 800 XYZ.

The following analyses will assume that the relative expensiveness of the April 70 calls persists. These are the calls that were sold in the position. If that overpricing should disappear, the spread would look more favorable, but there is no guarantee that they will cheapen – especially over a short time period such as one or two weeks.

How would the position look in 7 days at the stock prices determined above?

Stock Price	P&L	Delta	Gamma	Theta	Vega
54.46	1905	− 7.40	1.62	0.94	− 1.57
55.79	1077	− 4.90	2.07	1.18	− 1.96
57.16	606	− 1.97	2.13	1.53	− 2.90
58.56	528	0.74	1.65	2.00	− 4.62
60.00	771	2.38	0.56	2.63	− 7.22
61.47	1127	2.07	− 1.01	3.38	−10.63
62.98	1252	− 0.87	− 2.85	4.22	−14.56
64.52	702	− 6.73	− 4.67	5.07	−18.61
66.11	− 1019	−15.42	− 6.21	5.85	−22.31

In a similar manner, the position would have the following characteristics after 14 days had passed:

Stock Price	P&L	Delta	Gamma	Theta	Vega
52.31	4221	− 9.10	0.69	0.55	− 0.98
54.14	2731	− 6.93	1.69	0.75	− 0.89
56.02	1782	− 2.87	2.51	1.06	− 1.21
57.98	1717	2.17	2.44	1.61	− 2.69
60.00	2577	5.85	1.00	2.51	− 6.00
62.09	3839	5.29	− 1.63	3.73	−11.05
64.26	4361	− 1.55	− 4.61	5.09	−16.90
66.50	2631	−14.80	− 7.02	6.31	−22.17
68.82	− 2799	−32.83	− 8.32	7.18	−25.72

The same information will be presented graphically in Figure 40-13 so that those who prefer pictures instead of columns of numbers can follow the discussions easily.

First, the profitability of the spread can be examined. This profit picture assumes that the volatility of XYZ remains unchanged. Note that in 7 days, there is a small profit if the stock remains unchanged. This is to be expected, since theta was positive, and therefore time is working in favor of this spread. Likewise, in 14 days, there is an even bigger profit if XYZ remains relatively unchanged – again due to the positive theta. Overall, there is an expected profit of $800 in 7 days, or $2,600 in 14 days, from this position. This indicates that it is an attractive situation statistically, but, of course, it does not mean that one cannot lose money.

Continuing to look at the profit picture, the downside is favorable to the spread since the short stock in the position would contribute to ever larger profits in the case that XYZ tumbles dramatically (see Figure 40-12). The upside is where problems could develop. In 7 days, the position breaks even at about 65 on the upside; in 14 days, it breaks even at about 67.50.

The reader may be asking, "Why is there such a dramatic risk to the upside? I thought the position was delta neutral and gamma neutral." True, the position was originally neutral with respect to both those variables. That neutrality explains the flatness of the profit curves about the current stock price of 60. However, once the stock has moved 1.50 standard deviations to the upside, the neutrality begins to disappear. To see this, let us look at Figures 40-13 and 40-14 that show both the position delta and position gamma 7 days and 14 days after the spread was established. Again, these are the same numbers listed in the previous tables.

First, look at the position delta in 7 days (Figure 40-13). Note that the position remains relatively delta neutral with XYZ between 57 and 63. This is because the gamma was initially neutral. However, the position begins to get quite delta short if XYZ rises above 63 or falls below 57 in 7 days. What is happening to gamma while this is going on? Since we just observed that the delta eventually changes, that has to mean that the position is acquiring some gamma.

FIGURE 40-12.
XYZ ratio spread, gamma and delta neutral.

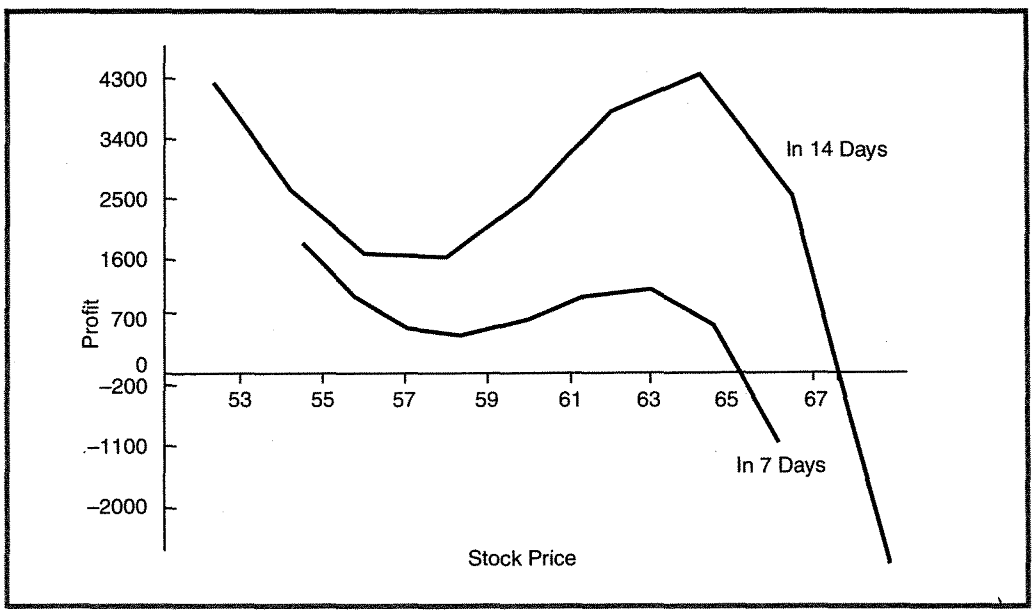


FIGURE 40-13.
XYZ ratio spread, position delta.

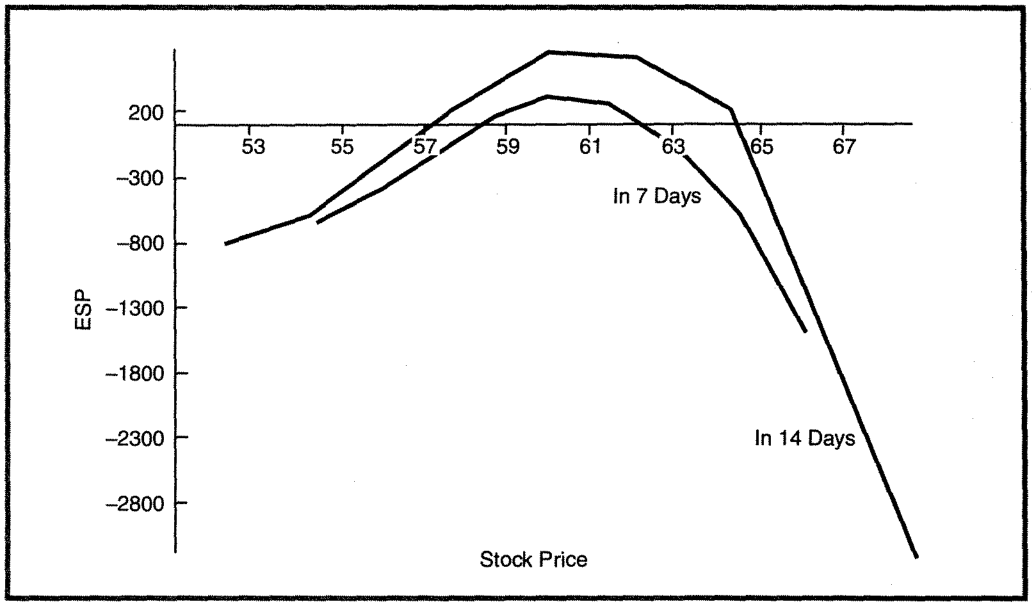


FIGURE 40-14.
XYZ ratio spread, position gamma.

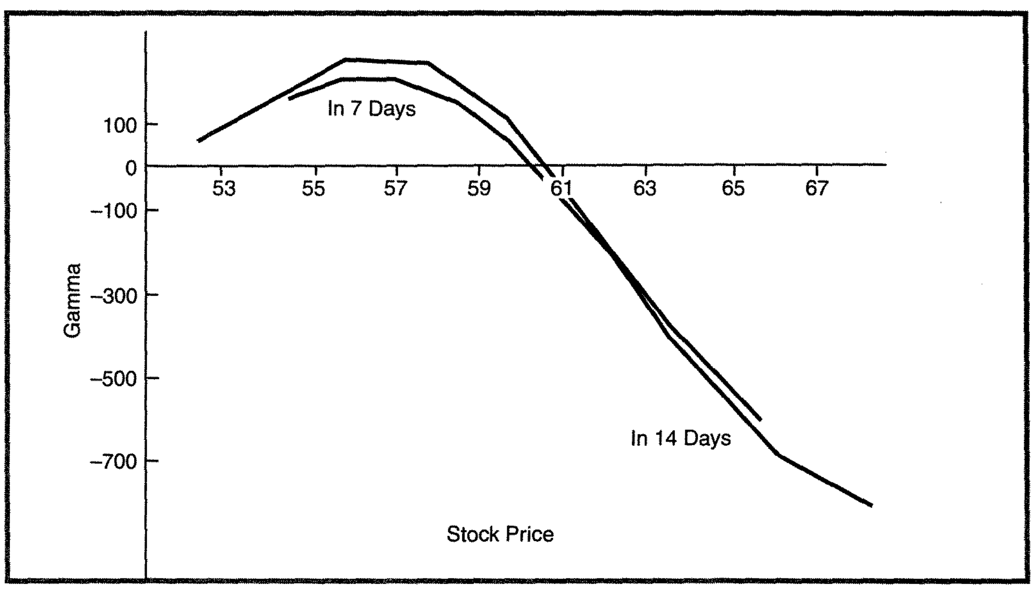


Figure 40-14 depicts the fact that gamma is not very stable, considering that it started at nearly zero. If XYZ falls, gamma increases a little, reflecting the fact that the position will get somewhat shorter as XYZ falls. But since there are only calls coupled with short stock in this position, there is no risk to the downside. Positive gamma, even a small positive gamma like this one, is beneficial to stock movement.

The upside is another matter entirely. The gamma begins to become seriously negative above a stock price of 63 in 7 days. Recall that negative gamma means that one's position is about to react poorly to price changes in the market – the position will soon be "fighting the market." As the stock goes even higher, the gamma becomes even more negative. These observations apply to stock price movements in either 7 days or 14 days; in fact, the effect on gamma does not seem to be particularly dependent on time in this example, since the two lines on Figure 40-15 are very close to each other.

The above information depicts in detailed form the fact that this position will not behave well if the stock rises too far in too short a time. However, stable stock prices will produce profits, as will falling prices. These are not earth-shattering conclusions since, by simple observation, one can see that there are extra short calls plus some short stock in the position. However, the point of calculating this information in advance is to be able to anticipate where to make adjustments and how much to adjust.

Follow-Up Action. How should the strategist use this information? A simplistic approach is to adjust the delta as it becomes non-neutral. This won't do anything for gamma, however, and may therefore not necessarily be the best approach. If one were to adjust only the delta, he would do it in the following manner: The chart of delta (Figure 40-13) shows that the position will be approximately delta short 800 shares if XYZ rises to 64.50 in a week. One simple plan would be to cover the 800 shares of XYZ that are short if the stock rises to 64.50. Covering the 800 shares would return the position to delta neutral at that time. Note that if the stock rises at a slower pace, the point at which the strategist would cover the 800 shares moves higher. For example, the delta in 14 days (again in Figure 40-13) shows that XYZ would have to be at about 65.50 for the position to be delta short 800 shares. Hence, if it took two weeks for XYZ to begin rising, one could wait until 65.50 before covering the 800 shares and returning the position to delta neutral.

In either case, the purchase of the 800 shares does not take care of the negative gamma that is creeping into the position as the stock rises. *The only way to counter negative gamma is to buy options, not stock.* To return a position to neutrality with

respect to more than one risk variable requires one to approach the problem as he did when the position was established: Neutralize the gamma first, and then use stock to adjust the delta. Note the difference between this approach and the one described in the previous paragraph. Here, we are trying to adjust gamma first, and will get to delta later.

In order to add some positive gamma, one might want to buy back (cover) some of the January 70 calls that are currently short. Suppose that the decision is made to cover when XYZ reaches 65.50 in 14 days. From the graph above, one can see that the position would be approximately gamma short 700 shares at the time. Suppose that the gamma of the January 70 calls is 0.07. Then, one would have to cover 100 January 70 calls to add 700 shares of positive gamma to the position, returning it to gamma neutral. This purchase would, of course, make the position delta long, so some stock would have to be sold short as well in order to make the position delta neutral once again.

Thus, the procedure for follow-up action is somewhat similar to that for establishing the position: First, neutralize the gamma and then eliminate the resulting delta by using the common stock. The resulting profit graph will not be shown for this follow-up adjustment, since the process could go on and on. However, a few observations are pertinent. First, *the purchase of calls to reduce the negative gamma hurts the original thesis of the position* – to have negative vega and positive theta, if possible. Buying calls will add vega to and subtract theta from the position, which is not desirable. However, it is more desirable than letting losses build up in the position as the stock continues to run to the upside. Second, *one might choose to remove the position if it is profitable.* This might happen if the volatility did decrease as expected. Then, when the stock rallies, producing negative gamma, one might actually have a profit, because his assumption concerning volatility had been right. If he does not see much further potential gains from decreasing volatility, he might use the point at which negative gamma starts to build up as the exit point from his position. Third, *one might choose to accept the acquired gamma risk.* Rather than jeopardize his initial thesis, one may just want to adjust the delta and let the gamma build up. This is no longer a neutral strategy, but one may have reasons for approaching the position this way. At least he has calculated the risk and is aware of it. If he chooses to accept it rather than eliminate it, that is his decision.

Finally, it is obvious that *the process is dynamic.* As factors change (stock price, volatility, time), the position itself changes and the strategist is presented with new choices. There is no absolutely correct adjustment. The process is more of an art than a science at times. Moreover, the strategist should continue to recalculate these profit pictures and risk measures as the stock moves and time passes, or if there is a

change in the securities involved in the position. There is one absolute truism and that is that *the serious strategist should be aware of the risk his position has with respect to at least the four basic measures of delta, gamma, theta, and vega.* To be ignorant of the risk is to be delinquent in the management of the position.

TRADING GAMMA FROM THE LONG SIDE

The strategist who is selling overpriced options and hedging that purchase with other options or stock will often have a position similar to the one described earlier. Large stock movements – at least in one direction – will typically be a problem for such positions. The opposite of this strategy would be to have a position that is long gamma. That is, the position does better if the stock moves quickly in one direction. While this seems pleasing to the psyche, these types of positions have their own brand of risk.

The simplest position with long gamma is a long straddle, or a backspread (reverse ratio spread). Another way to construct a position with long gamma is to invert a calendar spread – to buy the near-term option and to sell a longer-term one. Since a near-term option has a higher gamma than a longer-term one with the same strike, such a position has long gamma. In fact, traders who expect violent action in a stock often construct such a position for the very reason that the public will come in behind them, bid up the short-term calls (increasing their implied volatility), and make the spread more profitable for the trader.

Unfortunately, all of these positions often involve being long just about everything else, including theta and vega as well. This means that time is working against the position, and that swings in implied volatility can be helpful or harmful as well. Can one construct a position that is long gamma, but is not so subject to the other variables? Of course he can, but what would it look like? The answer, as one might suspect, is not an ironclad one.

For the following examples, assume these prices exist:

XYZ: 60

Option	Price	Delta	Gamma	Theta	Vega
March 60 call	3.25	0.54	0.0510	0.033	0.089
June 60 call	5.50	0.57	0.0306	0.021	0.147

Example: Suppose that a strategist wants to create a position that is *gamma long, but is neutral with respect to both delta and vega.* He thinks the stock will move, but is not sure of the price direction, and does not want to have any risk with respect to

quick changes in volatility. In order to quantify the statement that he "wants to be gamma long," let us assume that he wants to be gamma long 1,000 shares or 10 contracts.

It is known that delta can always be neutralized last, so let us concentrate on the other two variables first. The two equations below are used to determine the quantities to buy in order to make gamma long and vega neutral:

$0.0510x + 0.0306y = 10$ (gamma, expressed in # of contracts)

$0.089x + 0.147y = 0$ (vega)

The solution to these equations is:

$$x = 308, y = -186$$

Thus, one would buy 308 March 60 calls and would sell 186 June 60 calls. This is the reverse calendar spread that was discussed: Near-term calls are bought and longer-term calls are sold.

Finally, the delta must be neutralized. To do this, calculate the position delta using the quantities just determined:

$$\text{Position delta} = 0.54 \times 308 - 0.57 \times 186 = 60.30$$

So, the position is long 60 contracts, or 6,000 shares. It can be made delta neutral by selling short 6,000 shares of XYZ.

The overall position would look like this:

Position	Delta	Gamma	Vega
Short 6,000 XYZ	1.00	0	0
Long 308 March 60 calls	0.54	0.0510	0.089
Short 186 June 60 calls	0.57	0.0306	0.147

Its risk measurements are:

Position delta: long 30 shares (neutral)

Position vega: $7 (neutral)

Position gamma: long 1,001 shares

This position then satisfies the initial objectives of wanting to be gamma long 1,000 shares, but delta and vega neutral.

Finally, note that theta = –$625. The position will lose $625 per day from time decay.

The strategist must go further than this analysis, especially if one is dealing with positions that are not simple constructions. He should calculate a profit picture as

well as look at how the risk measures behave as time passes and the stock price changes.

Figure 40-15 (see Tables 40-10, 40-11, and 40-12) shows the profit potential in 7 days, in 14 days, and at March expiration. Figure 40-16 shows the position vega at the 7- and 14-day time intervals. Before discussing these items, the data will be presented in tabular form at three different times: in 7 days, in 14 days, and at March expiration.

The data in Table 40-10 depict the position in 7 days.

Table 40-11 represents the results in 14 days.

Finally, the position as it looks at March expiration should be known as well (see Table 40-12).

In each case, note that the stock prices are calculated in accordance with the statistical formula shown in the last section. The more time that passes, the further it is possible for the stock to roam from the current price.

The profit picture (Figure 40-15) shows that this position looks much like a long straddle would: It makes large, symmetric profits if the stock goes either way up or way down. Moreover, the losses if the stock remains relatively unchanged can be large. These losses tend to mount right away, becoming significant even in 14 days. Hence, if one enters this type of position, he had better get the desired stock movement quickly, or be prepared to cut his losses and exit the position.

The most startling thing to note about the entire position is the devastating effect of time on the position. The profit picture shows that large losses will result if the stock movement that is expected does not materialize. These losses are completely due to time decay. Theta is negative in the initial position ($625 of losses per day), and remains negative – and surprisingly constant – until March expiration (when the long calls expire). Time also affects vega. Notice how the vega begins to get negative right away and keeps getting much more negative as time passes. Simply, it can be seen that as time passes, the position becomes *vulnerable to increases in implied volatility.*

This relationship between time and volatility might not be readily apparent to the strategist unless he takes the time to calculate these sorts of tables or figures. In fact, one may be somewhat confounded by this observation. What is happening is that as time passes, the options that are owned are less explosive if volatility increases, but the options that were sold have a lot of time remaining, and are therefore apt to increase violently if volatility spurts upward.

Figures 40-17 and 40-18 provide less enlightening information about delta and gamma. Since gamma was positive to start with, the delta increases dramatically as the stock rises, and decreases just as fast if the stock falls (Figure 40-18). This is standard behavior for positions with long gamma; a long straddle would look very similar.

FIGURE 40-15.
Trading long gamma, profit picture.

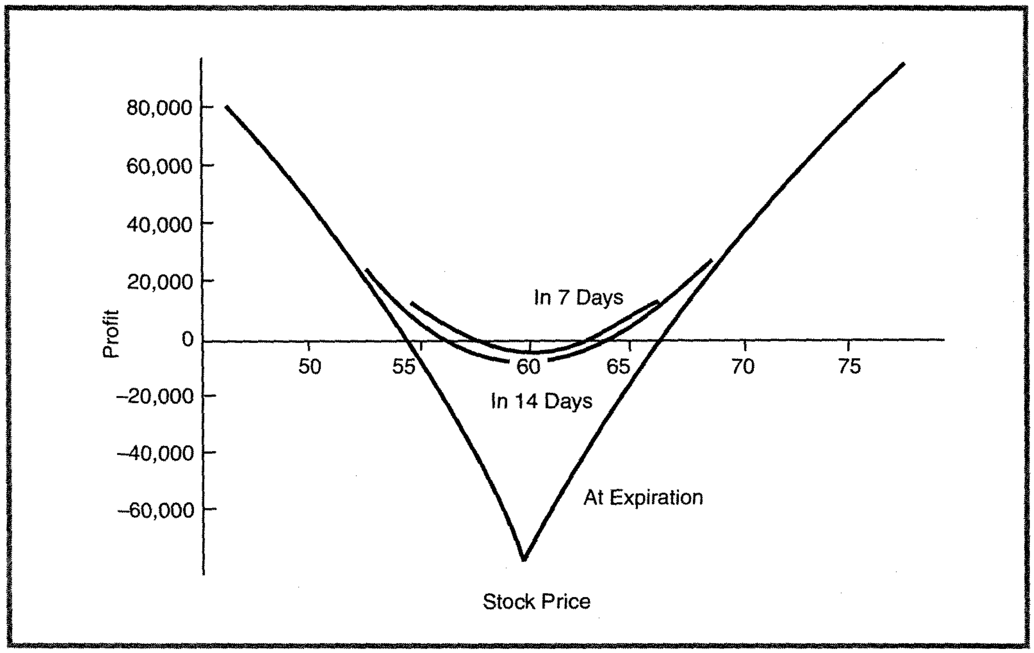


TABLE 40-10.
Risk measures of long gamma position in 7 days.

Stock Price	P&L	Delta	Gamma	Theta	Vega
54.46	12259	−58.72	8.28	4.15	−5.74
55.79	5202	−46.60	9.78	5.20	−4.18
57.16	−224	−32.45	10.80	6.09	−2.85
58.56	−3670	−16.91	11.25	6.73	−1.94
60.00	−4975	−0.80	11.08	7.04	−1.63
61.47	−3901	15.01	10.32	6.98	−1.96
62.98	−507	29.69	9.09	6.57	−2.89
64.52	5105	42.56	7.54	5.87	−4.29
66.11	12717	53.17	5.86	4.97	−5.96

Notice that gamma remains positive throughout (Figure 40-17), although it falls to smaller levels if the stock moves toward the end of the pricing ranges used in the analyses. Again, this is standard action for a long straddle.

FIGURE 40-16.
Trading long gamma, position vega.

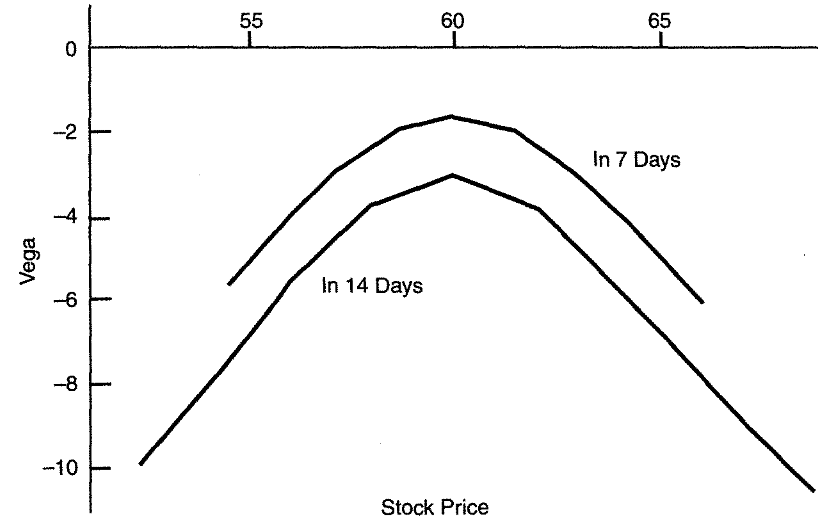


TABLE 40-11.
Risk measures of long gamma position in 14 days.

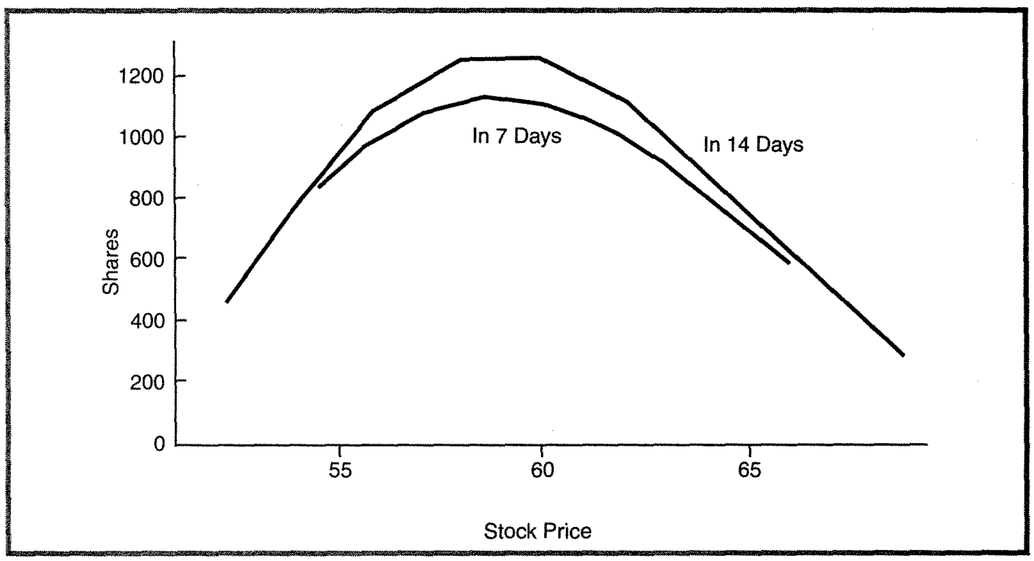
Stock Price	P&L	Delta	Gamma	Theta	Vega
52.31	24945	−79.34	4.75	2.10	− 9.91
54.14	11445	−67.68	8.00	3.91	− 7.87
56.02	277	−49.79	10.79	5.76	− 5.56
57.98	− 7263	−26.87	12.42	7.21	− 3.73
60.00	− 10141	− 1.44	12.47	7.88	− 3.04
62.09	− 7784	23.32	10.99	7.60	− 3.78
64.26	− 347	44.47	8.45	6.47	− 5.71
66.50	11491	60.12	5.55	4.82	− 8.20
68.82	26672	69.81	2.92	3.09	−10.48

So, is this a good position? That is a difficult question to answer unless one knows what is going to happen to the underlying stock. Statistically, this type of position has a negative expected return and would generally produce losses over the long run. However, in situations in which the near-term options are destined to get overheated – perhaps because of a takeover rumor or just a leak of material information

TABLE 40-12.
Risk measures of long gamma position at March expiration.

Stock Price	P&L	Delta	Gamma	Theta	Vega
46.19	81327	− 75.69	− 3.65	−1.32	− 6.88
49.31	55628	− 89.84	− 5.39	−2.25	−11.43
52.64	22378	−110.50	− 6.89	−3.33	−16.50
56.20	− 21523	−136.65	− 7.62	−4.28	−20.67
60.00	− 78907	144.68	− 7.29	−4.79	−22.49
64.06	− 25946	117.44	− 6.03	−4.70	−21.26
68.39	19787	95.03	− 4.31	−4.10	−17.44
73.01	59732	79.05	− 2.67	−3.24	−12.43
77.95	96062	69.19	− 1.43	−2.41	− 7.69

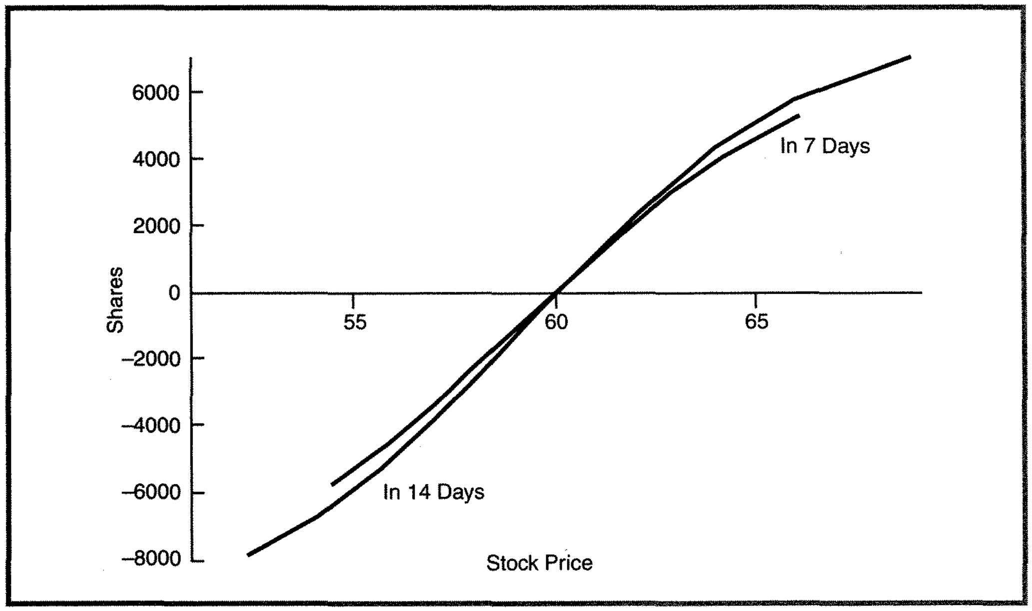
FIGURE 40-17.
Trading long gamma, position gamma.



about a company – many sophisticated traders establish this type of position to take advantage of the expected explosion in stock price.

Other Variations. Without going into as much detail, it is possible to compare the above position with similar ones. The purpose in doing so is to illustrate how a change in the strategist's initial requirements would alter the established

FIGURE 40-18.
Trading long gamma, position delta.



position. In the preceding position, the strategist wanted to be gamma long, but neutral with respect to delta and volatility. Suppose he not only expects price movement (meaning he wants positive gamma), but also expects an increase in volatility. If that were the case, he would want positive vega as well. Suppose he quantifies that desire by deciding that he wants to make $1,000 for every one percentage increase in volatility. The simultaneous equations would then be:

$$0.0501x + 0.0306y = 10 \text{ (gamma)}$$
$$0.089x + 0.147y = 10 \text{ (vega)}$$

The solution to these equations is:

$$x = 243, y = -80$$

Furthermore, 8,500 shares would have to be sold short in order to make the position delta neutral. The resulting position would then be:

Short 8,500 XYZ	Delta: neutral
Long 243 March 60 calls	Gamma: long 1,000 shares
Short 80 June 60 calls	Vega: long $1,000
	Theta: long $630

Recall that the position discussed in the last section was vega neutral and was:

Short 6,000 XYZ	Delta: neutral
Long 308 March 60 calls	Gamma: long 1,000 shares
Short 186 June 60 calls	Vega: neutral
	Theta: long \$625

Notice that in the new position, there are over three times as many long March 60 calls as there are short June 60 calls. This is a much larger ratio than in the vega neutral position, in which about 1.6 calls were bought for each one sold. This even greater preponderance of near-term calls that are purchased means the newer position has an even larger exposure to time decay than did the previous one. That is, in order to acquire the positive vega, one is forced to take on even more risk with respect to time decay. For that reason, this is a less desirable position than the first one; it seems overly risky to want to be both long gamma and long volatility.

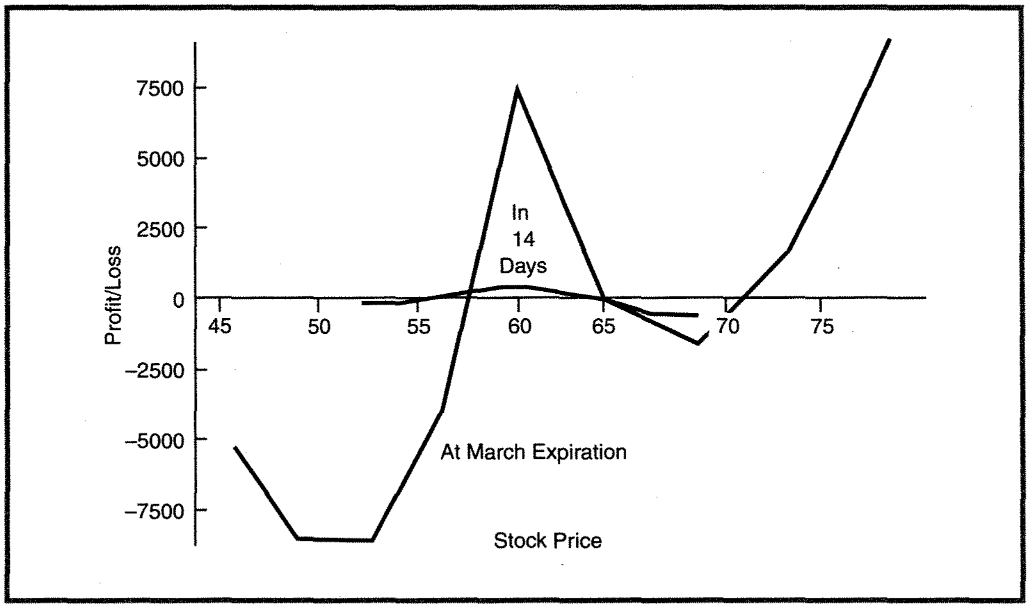
This does not necessarily mean that one would never want to be long volatility. In fact, if one expected volatility to increase, he might want to establish a position that was delta neutral and gamma neutral, but had positive vega. Again, using the same prices as in the previous examples, the following position would satisfy these criteria:

Short 2,600 XYZ	Delta: neutral
Short 64 March 60 calls	Gamma: neutral
Long 106 June 60 calls	Vega: long \$1,000
	Theta: long \$11

This position has a more conventional form. It is a calendar spread, except that more long calls are purchased. Moreover, the theta of this position is only \$11 – it will only lose \$11 per day to time decay. At first glance it might seem like the best of the three choices. Unfortunately, when one draws the profit graph (Figure 40-19), he finds that this position has significant downside risk: The short stock cannot compensate for the large quantity of June 60 calls. Still, the position does make money on the upside, and will also make money if volatility increases. If the near-term March calls were overpriced with respect to the June calls at the time the position was established, it would make it even more desirable.

To summarize, defining the risks one wants to take or avoid specifies the construction of the eventual position. The strategist should examine the potential risks and rewards, especially the profit picture. If the potential risks are not desirable, the strategist should rethink his requirements and try again. Thus, in the example presented, the strategist felt that he initially wanted to be long gamma, but it involved too

FIGURE 40-19.
Trading long gamma, "conventional" calendar.



much risk of time decay. A second attempt was made, introducing positive volatility into the situation, but that didn't seem to help much. Finally, a third analysis was generated involving only long volatility and not long gamma. The resulting position has little time risk, but has risk if the stock drops in price. It is probably the best of the three. The strategist arrives at this conclusion through a logical process of analysis.

ADVANCED MATHEMATICAL CONCEPTS

The remainder of this chapter is a short adjunct to Chapter 28 on mathematical applications. It is quite technical. Those who desire to understand the basic concepts behind the risk measures and perhaps to utilize them in more advanced ways will be interested in what follows.

CALCULATING THE "GREEKS"

It is known that the equation for delta is a direct byproduct of the Black–Scholes model calculation:

$$\Delta = N(d1)$$

Each of the risk measures can be derived mathematically by taking the partial derivative of the model. However, there is a shortcut approximation that works just as well. For example, the formula for gamma is as follows:

$$x = \ln\left[\frac{p}{s \times (1 + r)^t}\right] \Big/ v\sqrt{t} + \frac{v\sqrt{t}}{2}$$

$$\Gamma = \frac{e^{(-x^{2/2})}}{pv\sqrt{2\pi t}}$$

There is a simpler, yet correct, way to arrive at the gamma. The delta is the partial derivative of the Black–Scholes model with respect to stock price – that is, it is the amount by which the option's price changes for a change in stock price. The gamma is the change in delta for the same change in stock price. Thus, one can approximate the gamma by the following steps:

1. Calculate the delta with p = Current stock price.
2. Set p = p + 1 and recalculate the delta.
3. Gamma = delta from step 1 – delta from step 2.

The same procedure can be used for the other "greeks":

Vega:
1. Calculate the option price with a particular volatility.
2. Calculate another option price with volatility increased by 1%.
3. Vega = difference of the prices in steps 1 and 2.

Theta:
1. Calculate the option price with the current time to expiration.
2. Calculate the option price with 1 day less time remaining to expiration.
3. Theta = difference of the prices in steps 1 and 2.

Rho:
1. Calculate the option price with the current risk-free interest rate.
2. Calculate the option price with the rate increased by 1%.
3. Rho = difference of the prices in steps 1 and 2.

THE GAMMA OF THE GAMMA

The discussion of this concept was deferred from earlier sections because it is somewhat difficult to grasp. It is included now for those who may wish to use it at some time. Those readers who are not interested in such matters may skip to the next section.

Recall that this is the sixth risk measurement of an option position. *The gamma of the gamma is the amount by which the gamma will change when the stock price changes.*

Recall that in the earlier discussion of gamma, it was noted that gamma changes. This example is based on the same example used earlier.

Example: With XYZ at 49, assume the January 50 call has a delta of 0.50 and a gamma of 0.05. If XYZ moves up 1 point to 50, the delta of the call will increase by the amount of the gamma: It will increase from 0.50 to 0.55. Simplistically, if XYZ moves up another point to 51, the delta will increase by another 0.05, to 0.60.

Obviously, the delta cannot keep increasing by 0.05 each time XYZ gains another point in price, for it will eventually exceed 1.00 by that calculation, and it is known that the delta has a maximum of 1.00. Thus, it is obvious that the gamma changes.

In reality, the gamma decreases as the stock moves away from the strike. Thus, with XYZ at 51, the gamma might only be 0.04. Therefore, if XYZ moved up to 52, the call's delta would only increase by 0.04, to 0.64. Hence, the gamma of the gamma is –0.01, since the gamma decreased from .05 to .04 when the stock rose by one point.

As XYZ moves higher and higher, the gamma will get smaller and smaller. Eventually, with XYZ in the low 60's, the delta will be nearly 1.00 and the gamma nearly 0.00.

This change in the *gamma* as the stock moves is called the *gamma of the gamma.* It is probably referred to by other names, but since its use is limited to only the most sophisticated traders, there is no standard name. Generally, one would use this measure on his entire portfolio to gauge how quickly the portfolio would be responding to the position gamma.

Example: With XYZ at 31.75 as in some of the previous examples, the following risk measures exist:

Position	Option Delta	Option Gamma	Option Gamma/Gamma	Position Gamma/Gamma
Short 4,500 XYZ	1.00	0.00	0.0000	0
Short 100 XYZ April 25 calls	0.89	0.01	–0.0015	–15
Long 50 XYZ April 30 calls	0.76	0.03	–0.0006	– 3
Long 139 XYZ July 30 calls	0.74	0.02	–0.0003	– 4
		Total Gamma of Gamma:		–22

Recall that, in the same example used to describe gamma, the position was delta long 686 shares and had a positive gamma of 328 shares. Furthermore, we now see that the gamma itself is going to decrease as the stock moves up (it is negative) or will increase as the stock moves down. In fact, it is expected to increase or decrease by 22 shares for each point XYZ moves.

So, if XYZ moves up by 1 point, the following should happen:

a. Delta increases from 686 to 1,014, increasing by the amount of the gamma.
b. Gamma decreases from 328 to 306, indicating that a further upward move by XYZ will result in a smaller increase in delta.

One can build a general picture of how the gamma of the gamma changes over different situations – in- or out-of-the-money, or with more or less time remaining until expiration. The following table of two index calls, the January 350 with one month of life remaining and the December 350 with eleven months of life remaining, shows the delta, gamma, and gamma of the gamma for various stock prices.

Index	January 350 call			December 350 call		
Price	Delta	Gamma	Gamma/Gamma	Delta	Gamma	Gamma/Gamma
310	.0006	.0001	.0000	.3203	.0083	.0000
320	.0087	.0020	.0004	.3971	.0082	.0000
330	.0618	.0100	.0013	.4787	.0080	–.0000
340	.2333	.0744	.0013	.5626	.0078	–.0001
350	.5241	.0309	–.0003	.6360	.0073	–.0001
360	.7957	.0215	–.0014	.6984	.0067	–.0001
370	.9420	.0086	–.0010	.7653	.0060	–.0001
380	.9892	.0021	–.0003	.8213	.0052	–.0001

Several conclusions can be drawn, not all of which are obvious at first glance. First of all, the gamma of the gamma for long-term options is very small. This should be expected, since the delta of a long-term option changes very slowly. The next fact can best be observed while looking at the shorter-term January 350 table. The gamma of the gamma is near zero for deeply out-of-the-money options. But, as the option comes closer to being in-the-money, the gamma of the gamma becomes a positive number, reaching its maximum while the option is still out-of-the-money. By the time the option is at-the-money, the gamma of the gamma has turned negative. It then remains negative, reaching its most negative point when slightly in-the-money. From there on, as the option goes even deeper into-the-money, the gamma of the gamma remains negative but gets closer and closer to zero, eventually reaching (minus) zero when the option is very far in-the-money.

Can one possibly reason this risk measurement out without making severe mathematical calculations? Well, possibly. Note that the delta of an option starts as a small number when the option is out-of-the-money. It then increases, slowly at first, then more quickly, until it is just below 0.60 for an at-the-money option. From there on, it will continue to increase, but much more slowly as the option becomes in-the-money. This movement of the delta can be observed by looking at gamma: It is the change in the delta, so it starts slowly, increases as the stock nears the strike, and then begins to decrease as the option is in-the-money, always remaining a positive number, since delta can only change in the positive direction as the stock rises. Finally, the gamma of the gamma is the change in the gamma, so it in turn starts as a positive number as gamma grows larger; but then when gamma starts tapering off, this is reflected as a negative gamma of the gamma.

In general, the gamma of the gamma is used by sophisticated traders on large option positions where it is not obvious what is going to happen to the gamma as the stock changes in price. Traders often have some feel for their delta. They may even have some feel for how that delta is going to change as the stock moves (i.e., they have a feel for gamma). However, sophisticated traders know that even positions that start out with zero delta and zero gamma may eventually acquire some delta. The gamma of the gamma tells the trader how much and how soon that eventual delta will be acquired.

MEASURING THE DIFFERENCE OF IMPLIED VOLATILITIES

Recall that when the topic of implied volatility was discussed, it was shown that if one could identify situations in which the various options on the same underlying security had substantially different implied volatilities, then there might be an attractive neutral spread available. The strategist might ask how he is to determine if the discrepancies between the individual options are significantly large to warrant attention. Furthermore, is there a quick way (using a computer, of course) to determine this?

A logical way to approach this is to look at each individual implied volatility and compute the standard deviation of these numbers. This standard deviation can be converted to a percentage by dividing it by the overall implied volatility of the stock. This percentage, if it is large enough, alerts the strategist that there may be opportunities to spread the options of this underlying security against each other. An example should clarify this procedure.

Example: XYZ is trading at 50, and the following options exist with the indicated implied volatilities. We can calculate a standard deviation of these implieds, called implied deviation, via the formula:

Implied deviation = sqrt (sum of differences from mean)^2/(# options – 1)

XYZ: 50

Option	Implied Volatility	Difference from Average
October 45 call	21%	–9.44
November 45 call	21%	–9.44
January 45 call	23%	–7.44
October 50 call	32%	+1.56
November 50 call	30%	–0.44
January 50 call	28%	–2.44
October 55 call	40%	+9.56
November 55 call	37%	+6.56
January 55 call	34%	+3.56

Average: 30.44%

Sum of (difference from avg)^2 = 389.26

Implied deviation = sqrt (sum of diff)^2/(# options – 1)

= sqrt (389.26 / 8)

= 6.98

This figure represents the raw standard deviation of the implied volatilities. To convert it into a useful number for comparisons, one must divide it by the average implied volatility.

$$\text{Percent deviation} = \frac{\text{Implied deviation}}{\text{Average implied}}$$

= 6.98/30.44

= 23%

This "percent deviation" number is usually significant if it is larger than 15%. That is, if the various options have implied volatilities that are different enough from each other to produce a result of 15% or greater in the above calculation, then the strategist should take a look at establishing neutral spreads in that security or futures contract.

The concept presented here can be refined further by using a weighted average of the implieds (taking into consideration such factors as volume and distance from the striking price) rather than just using the raw average. That task is left to the reader.

Recall that a computer can perform a large number of Black–Scholes calculations in a short period of time. Thus, the computer can calculate each option's implied volatility and then perform the "percent deviation" calculation even faster. The strategist who is interested in establishing this type of neutral spread would only have to scan down the list of percent deviations to find candidates for spreading. On a given day, the list is usually quite short – perhaps 20 stocks and 10 futures contracts will qualify.

SUMMARY

In today's highly competitive and volatile option markets, neutral traders must be extremely aware of their risks. That risk is not just risk at expiration, but also the current risk in the market. Furthermore, they should have an idea of how the risk will increase or decrease as the underlying stock or futures contract moves up and down in price. Moreover, the passage of time or the volatility that the options are being assigned in the marketplace – the implied volatility – are important considerations. Even changes in short-term interest rates can be of interest, especially if longer-term options (LEAPS) are involved.

Once the strategist understands these concepts, he can use them to select new positions, to adjust existing ones, and to formulate specific strategies to take advantage of them. He can select a specific criteria that he wants to exploit – selling high volatility, for example – and use the other measures to construct a position that has little risk with respect to any of the other variables. Furthermore, the market-maker or specialist, who does not want to acquire any market risk if he can help it, will use these techniques to attempt to neutralize all of the current risk, if possible.

CHAPTER 41

Taxes

In this chapter, the basic tax treatment of listed options will be outlined and several tax strategies will be presented. The reader should be aware of the fact that tax laws change, and therefore should consult tax counsel before actually implementing any tax-oriented strategy. The interpretation of certain tax strategies by the Internal Revenue Service is subject to reclarification or change, as well.

An option is a capital asset and any gains or losses are capital gains or losses. Differing tax consequences apply, depending on whether the option trade is a complete transaction by itself, or whether it becomes part of a stock transaction via exercise or assignment. Listed option transactions that are closed out in the options market or are allowed to expire worthless are capital transactions. The holding period for option transactions to qualify as long-term is always the same as for stocks (currently, it's one year). Gains from option purchases could possibly be long-term gains if the holding period of the option exceeds the long-term capital gains holding period.

Gains from the sale of options are short-term capital gains. In addition, the tax treatment of futures options and index options and other listed nonequity options may differ from that of equity options. We will review these points individually.

HISTORY

In the short life of listed option trading, there have been several major changes in the tax rules. When options were first listed in 1973, the tax laws treated the gains and losses from writing options as ordinary income. That is, the thinking was that only professionals or those people in the business actually wrote over-the-counter options, and thus their gains and losses represented their ordinary income, or means of making a living. This rule presented some interesting strategies involving spreads, because the long side of the spread could be treated as long-term gain (if held for

more than 6 months, which was the required holding period for a long-term gain at that time), and the short side of the spread could be ordinary loss. Of course, the stock would have had to move in the desired direction in order to obtain this result.

In 1976, the tax laws changed. The major changes affecting option traders were that the long-term holding period was extended to one year and also that gains or losses from writing options were considered to be capital gains. The extension of the long-term period essentially removed all possibilities of listed option holders ever obtaining a long-term gain, because the listed option market's longest-term options had only 9 months of life.

All through this period there were a wide array of tax strategies that were available, legally, to allow investors to defer capital gains from one year to the next, thereby avoiding payment of taxes. Essentially, one would enter into a spread involving deep in-the-money options that would expire in the next calendar year. Perhaps the spread would be established during October, using January options. Then one would wait for the underlying stock to move. Once a move had taken place, the spread would have a profit on one side and a loss on the other. The loss would be realized by rolling the losing option into another deep in-the-money option. The realized loss could thus be claimed on that year's taxes. The remaining spread – now an unrealized profit – would be left in place until expiration, in the next calendar year. At that time, the spread would be removed and the gain would be realized. Thus, the gain was moved from one year to the next. Then, later in that year, the gain would again be rolled to the next calendar year, and so on.

These practices were effectively stopped by the new tax ruling issued in 1984. Two sweeping changes were made. First, the new rules stated that, in any spread position involving offsetting options – as the two deep in-the-money options in the previous example – the losses can be taken only to the extent that they exceed the unrealized gain on the other side of the spread. (The tax literature insists on calling these positions "straddles" after the old commodity term, but for options purposes they are really spreads or covered writes.) As a by-product of this rule, the holding period of stock can be terminated or eliminated by writing options that are too deeply in-the-money. Second, the new rules required that all positions in nonequity options and all futures be marked to market at the end of the tax year, and that taxes be paid on realized and unrealized gains alike. The tax rate for nonequity options was lowered from that of equity options. Then, in 1986, the long-term and short-term capital gains rates were made equal to the lowest ordinary rate. All of these points will be covered in detail.

BASIC TAX TREATMENT

Listed options that are exercised or assigned fall into a different category for tax purposes. The original premium of the option transaction is combined into the stock transaction. There is no tax liability on this stock position until the stock position itself is closed out. There are four different combinations of exercising or assigning puts or calls. Table 41-1 summarizes the method of applying the option premium to the stock cost or sale price.

Examples of how to treat these various transactions are given in the following sections. In addition to examples explaining the basic tax treatment, some supplementary strategies are included as well.

CALL BUYER

If a call holder subsequently sells the call or allows it to expire worthless, he has a capital gain or loss. For equity options, the holding period of the option determines whether the gain or loss is long-term or short-term. As mentioned previously, a long-term gain would be possible if held for more than one year. For tax purposes, an option that expires worthless is considered to have been sold at zero dollars on the expiration date.

Example: An investor purchases an XYZ October 50 call for 5 points on July 1. He sells the call for 9 points on September 1. That is, he realizes a capital gain via a closing transaction. His taxable gain would be computed as shown in Table 41-1, assuming that a $25 commission was paid on both the purchase and the sale.

TABLE 41-1.
Applying the option premium to the stock cost or sale price.

Action	Tax Treatment
Call buyer exercises	Add call premium to stock cost
Put buyer exercises	Subtract put premium from stock sale price
Call writer assigned	Add call premium to stock sale price
Put writer assigned	Subtract put premium from stock cost
Net proceeds of sale ($900 – $25)	$875
Net cost ($500 + $25)	–525
Short-term gain:	$350

Alternatively, if the stock had fallen in price by October expiration and the October 50 call had expired worthless, the call buyer would have lost $525 – his entire net cost. If he had held the call until it expired worthless, he would have a short-term capital loss of $525 to report among his taxable transactions.

PUT BUYER

The holder of a put has much the same tax consequences as the holder of a call, provided that he is not also long the underlying stock. This initial discussion of tax consequences to the put holder will assume that he does not simultaneously own the underlying stock. If the put holder sells his put in the option market or allows it to expire worthless, the gain or loss is treated as capital gain, long-term for equity puts held more than one year. Historically, the purchase of a put was viewed as perhaps the only way an investor could attain a long-term gain in a declining market.

Example: An investor buys an XYZ April 40 put for 2 points with the stock at 43. Later, the stock drops in price and the put is sold for 5 points. The commissions were $25 on each option trade, so the tax consequences would be:

Net sale proceeds ($500 – $25)	$475
Net cost ($200 + $25)	–225
Short-term capital gain:	$250

Alternatively, if he had sold the put at a loss, perhaps in a rising market, he would have a short-term capital loss. Furthermore, if he allowed the put to expire totally worthless, his short-term loss would be equal to the entire net cost of $225.

CALL WRITER

Written calls that are bought back in the listed option market or are allowed to expire worthless are short-term capital gains. A written call cannot produce a long-term gain, regardless of the holding period. This treatment of a written call holds true even if the investor simultaneously owned the underlying stock (that is, he had a covered write). As long as the call is bought back or allowed to expire worthless, the gain or loss on the call is treated separately from the underlying stock for tax purposes.

Example: A trader sells naked an XYZ July 30 call for 3 points and buys it back three months later at a price of 1. The commissions were $25 for each trade, so the tax gain would be:

Net sale proceeds ($300 – $25)	$275
Net cost ($100 + $25)	–125
Short-term gain:	$150

If the investor had not bought the call back, but had been fortunate enough to be able to allow it to expire worthless, his gain for tax purposes would have been the entire $275, representing his net sale proceeds. The purchase cost is considered to be zero for an option that expires worthless.

PUT WRITER

The tax treatment of written puts is quite similar to that of written calls. If the put is bought back in the open market or is allowed to expire worthless, the transaction is a short-term capital item.

Example: An investor writes an XYZ July 40 put for 4 points, and later buys it back for 2 points after a rally by the underlying stock. The commissions were $25 on each option trade, so the tax situation would be:

Net put sale price ($400 – $25)	$375
Net put cost ($100 + $25)	–125
Short-term gain:	$250

If the put were allowed to expire worthless, the investor would have a net gain of $375, and this gain would be short-term.

THE 60/40 RULE

As mentioned earlier, *nonequity option positions and future positions must be marked to market at the end of the tax year and taxes paid on both the unrealized and realized gains and losses.* This same rule applies to futures positions. The tax rate on these gains and losses is lower than the equity options rate. *Regardless of the actual holding period of the positions, one treats 60% of his tax liability as long-term and 40% as short-term.* This ruling means that even gains made from extremely short-term activity such as day-trading can qualify partially as long-term gains.

Since 1986, long-term and short-term capital gains rates have been equal. If long-term rates should drop, then the rule would again be more meaningful.

Example: A trader in nonequity options has made three trades during the tax year. It is now the end of the tax year and he must compute his taxes. First, he bought S&P

500 calls for $1,500 and sold them 6 weeks later for $3,500. Second, he bought an OEX January 160 call for 3.25 seven months ago and still holds it. It currently is trading at 11.50. Finally, he sold 5 SPX February 250 puts for 1.50 three days ago. They are currently trading at 2. The net gain from these transactions should be computed without regard to holding period.

Nonequity Contract	Original Price	Current Price	Cost	Proceeds	Gain/ Loss	
S&P calls	–	–	$1,500	$3,500	+$2,000	realized
OEX January 160	3.25	11.50	$ 325	$1,150	+ 825	unrealized
SPX February 250	1.50	2.00	$1,000	$ 750	– 250	unrealized
Total capital gains					+$2,575	

The total taxable amount is $2,575, regardless of holding period and regardless of whether the item is realized or unrealized. Of this total taxable amount, 60% ($1,545) is subject to long-term treatment and 40% ($1,030) is subject to short-term treatment.

In practice, one computes these figures on a separate form (Section 1256) and merely enters the two final figures – $1,545 and $1,030 – on the tax schedule for capital gains and losses. Note that if one loses money in nonequity options, he actually has a tax disadvantage in comparison to equity options, because he must take some of his loss as a long-term loss, while the equity option trader can take all of his loss as short-term.

EXERCISE AND ASSIGNMENT

Except for a specified situation that we will discuss later, exercise and assignment do not have any tax effect for nonequity options because everything is marked to market at the end of the year. However, since equity options are subject to holding period considerations, the following discussion pertains to them.

CALL EXERCISE

An equity call holder who has an in-the-money call might decide to exercise the call rather than sell it in the options market. If he does this, there are no tax consequences on the option trade itself. Rather, the cost of the stock is increased by the net cost of the original call option. Moreover, the holding period begins on the day the stock is

purchased (the day after the call was exercised). The option's holding period has no bearing on the stock position that resulted from the exercise.

Example: An XYZ October 50 call was bought for 5 points on July 1. The stock had risen by October expiration, and the call holder decided to exercise the call on October 20th. The option commission was $25 and the stock commission was $85. The cost basis for the stock would be computed as follows:

Buy 100 XYZ at 50 via exercise	
($5,000 plus $85 commission)	$5,085
Original call cost ($500 plus $25)	525
Total tax basis of stock	$5,610
Holding period of stock begins on October 21.	

When this stock is eventually sold, it will be a gain or a loss, depending on the stock's sale price as compared to the tax basis of $5,610 for the stock. Furthermore, it will be a short-term transaction unless the stock is held until October 21st of the following year.

CALL ASSIGNMENT

If a written call is not closed out, but is instead assigned, the call's net sale proceeds are added to the sale proceeds of the underlying stock. The call's holding period is lost, and the stock position is considered to have been sold on the date of the assignment.

Example: A naked writer sells an XYZ July 30 call for 3 points, and is later assigned rather than buying back the option when it was in-the-money near expiration. The stock commission is $75. His net sale proceeds for the stock would be computed as follows:

Net call sale proceeds ($300 – $25)	$ 275
Net stock proceeds from assignment	
of 100 shares at 30 ($3,000 – $75)	2,925
Net stock sale proceeds	$3,200

In the case in which the investor writes a naked, or uncovered, call, he sells stock short upon assignment. He may, of course, cover the short sale by purchasing stock in the open market for delivery. Such a short sale of stock is governed by the

applicable tax rules pertaining to short sales – that any gains or losses from the short sale of stock are short-term gains or losses.

Tax Treatment for the Covered Writer. If, on the other hand, the investor was assigned on a covered call – that is, he was operating the covered writing strategy – and he elects to deliver the stock that he owns against the assignment notice, he has a complete stock transaction. The net cost of the stock was determined by its purchase price at an earlier date and the net sale proceeds are, of course, determined by the assignment in accordance with the preceding example.

Determining the proceeds from the stock purchase and sale is easy, but determining the tax status of the transaction is not. In order to prevent stockholders from using deeply in-the-money calls to protect their stock while letting it become a long-term item, some complicated tax rules have been passed. They can be summarized as follows:

1. If the equity option was out-of-the-money when first written, it has no effect on the holding period of the stock.
2. If the equity option was too deeply in-the-money when first written *and the stock was not yet held long-term,* then the holding period of the stock is *eliminated.*
3. If the equity option was in-the-money, but not too deeply, then the holding period of the stock is suspended while the call is in place.

These rules are complicated and merit further explanation. The first rule merely says that one can write out-of-the-money calls without any problem. If the stock later rises and is called away, the sale proceeds for the stock include the option premium, and the transaction is long-term or short-term depending on the holding period of the stock.

Example: Assume that on September 1st of a particular year, an investor buys 100 XYZ at 35. He holds the stock for a while, and then on July 15th of the following year – after the stock has risen to 43 – he sells an October 45 call for 3 points.

Net call sale proceeds ($300 – $25)	$ 275	
Net stock proceeds from assignment ($4,500 – $75)	$4,425	
Net stock sale proceeds	$4,700	$4,700
Net stock cost ($3,500 + $75)		$3,575
Net long-term gain		+$1,125

Thus, this covered writer has a net gain of $1,125 and it is a long-term gain because the stock was held for more than one year (from September 1st of the year in which he bought it, to October expiration of the next year, when the stock was called away).

Note that in a similar situation in which the stock had been held for less than one year before being called away, the gain would be short-term.

Let us now look at the other two rules. They are related in that their differentiation relies on the definition of "too deeply in-the-money." They come into play only if the stock was not already held long-term when the call was written. If the written call is too deeply in-the-money, it can eliminate the holding period of short-term stock. Otherwise, it can suspend it. If the call is in-the-money, but not too deeply in-the-money, it is referred to as a qualified covered call. There are several rules regarding the determination of whether an in-the-money call is qualified or not. Before actually getting to that definition, which is complicated, let us look at two examples to show the effect of the call being qualified or not qualified.

Example: Qualified Covered Write: On March 1st, an investor buys 100 XYZ at 35. He holds the stock for $3\frac{1}{2}$ months, and, on July 15th, the stock has risen to 43. This time he sells an in-the-money call, the October 40 call for 6. By October expiration, the stock has declined and the call expires worthless.

He would now have the following situation: a $575 short-term gain from the sale of the call, plus he is long 100 XYZ with a holding period of only $3\frac{1}{2}$ months. Thus, the sale of the October call suspended his holding period, but did not eliminate it.

He could now hold the stock for another $8\frac{1}{2}$ months and then sell it as a long-term item.

If the stock in this example had stayed above 40 and been called away, the net result would have been that the option proceeds would have been added to the stock sale price as in previous examples, and the entire net gain would have been short-term due to the fact that the writing of the qualified covered call had suspended the holding period of the stock at $3\frac{1}{2}$ months.

That example was one of writing a call which was not too deeply in-the-money. If, however, one writes a call on stock that is not yet held long-term and the call is too deeply in-the-money, then the holding period of the stock is *eliminated*. That is, if the call is subsequently bought back or expires worthless, the stock must then be held for another year in order to qualify as a long-term investment. This rule can work to an investor's advantage. If one buys stock and it goes down and he is in jeopardy of having a long-term loss, but he really does not want to sell the stock, he can sell a call

that is too deeply in-the-money (if one exists), and eliminate the holding period on the stock.

Qualified Covered Call. The preceding examples and discussion summarize the covered writing rules. Let us now look at what is a qualified covered call. The following rules are the literal interpretation. Most investors work from tables that are built from these rules. Such a table may be found in Appendix E. (Be aware that these rules may change, and consult a tax advisor for the latest figures.) A covered call is qualified if:

1. the option has more than 30 days of life remaining when it is written, and
2. the strike of the written call is not lower than the following benchmarks:
   a. First determine the applicable stock price (ASP). That is normally the closing price of the stock on the previous day. However, if the stock opens more than 110% higher than its previous close, then the applicable stock price is that higher opening.
   b. If the ASP is less than $25, then the benchmark strike is 85% of ASP. So any call written with a strike lower than 85% of ASP would not be qualified. (For example, if the stock was at 12 and one wrote a call with a striking price of 10, it would not be qualified – it is too deeply in-the-money.)
   c. If the ASP is between 25.13 and 60, then the benchmark is the next lowest strike. Thus, if the stock were at 39 and one wrote a call with a strike of 35, it would be qualified.
   d. If the ASP is greater than 60 and not higher than 150, and the call has more than 90 days of life remaining, the benchmark is two strikes below the ASP. There is a further condition here that the benchmark cannot be more than 10 points lower than the ASP. Thus, if a stock is trading at 90, one could write a call with a strike of 80 as long as the call had more than 90 days remaining until expiration, and still be qualified.
   e. If the ASP is greater than 150 and the call has more than 90 days of life remaining, the benchmark is two strikes below the ASP. Thus, if there are 10-point striking price intervals, then one could write a call that was 20 points in-the-money and still be qualified. Of course, if there are 5-point intervals, then one could not write a call deeper than 10 points in-the-money and still be qualified.

These rules are complicated. That is why they are summarized in Appendix E. In addition, they are always subject to change, so if an investor is considering writing an in-the-money covered call against stock that is still short-term in nature, he should check with his tax advisor and/or broker to determine whether the in-the-money call is qualified or not.

There is one further rule in connection with qualified calls. Recall that we stated that the above rules apply only if the stock is not yet held long-term when the call is written. If the stock is already long-term when the call is written, then it is considered long-term when called away, regardless of the position of the striking price when the call was written. However, if one sells an in-the-money call on stock already held long-term, and then subsequently buys that call back at a loss, *the loss on the call must be taken as a long-term loss* because the stock was long-term.

Overall, a rising market is the best, taxwise, for the covered call writer. If he writes out-of-the-money calls and the stock rises, he could have a short-term loss on the calls plus a long-term gain on the stock.

Example: On January 2nd of a particular year, an investor bought 100 shares of XYZ at 32, paying $75 in commissions, and simultaneously wrote a July 35 call for 2 points. The July 35 expired worthless, and the investor then wrote an October 35 call for 3 points. In October, with XYZ at 39, the investor bought back the October 35 call for 6 points (it was in-the-money) and sold a January 40 call for 4 points. In January, on the expiration day, the stock was called away at 40. The investor would have a long-term capital gain on his stock, because he had held it for more than one year. He would also have two short-term capital transactions from the July 35 and October 35 calls. Tables 41-2 and 41-3 show his net tax treatment from operating this covered writing strategy. The option commission on each trade was $25.

Things have indeed worked out quite well, both profit-wise and tax-wise, for this covered call writer. Not only has he made a net profit of $850 from his transactions on the stock and options over the period of one year, but he has received very favorable tax treatment. He can take a short-term loss of $175 from the combined July and October option transactions, and is able to take the $1,025 gain as a long-term gain.

TABLE 41-2.
Summary of trades.

January 2	Bought 100 XYZ at 32
July	Sold 1 July 35 call at 2 July call expired worthless (XYZ at 32) Sold 1 October 35 call at 3
October	Bought back October 35 call for 6 points (XYZ at 39) Sold 1 January 40 call for 4 points (of the following year)
January	100 XYZ called away at 40

TABLE 41-3.
Tax treatment of trades.

Short-term capital items:		
July 35 call:	Net proceeds ($200 – $25)	$175
	Net cost (expired worthless)	0
	Short-term capital gain	$175
October 35 call:	Net proceeds ($300 – $25)	$275
	Net cost ($600 + $25)	– 625
	Short-term capital loss	($350)
Long-term capital item:		
100 shares XYZ:	Purchased January 2 of one year and sold at January expiration of the following year. Therefore, held for more than one year, qualifying for long-term treatment.	
	Net sale proceeds of stock (assigned call):	
	January 40 call sale proceeds ($400 – $25)	$375
	Sold 100 XYZ at 40 strike ($4,000 – $75)	+ 3,925
	Net cost of stock (January 2 trade):	$4,300
	Bought 100 at 32 ($3,200 + $75)	– 3,275
	Long-term capital gain	$1,025

This example demonstrates an important tax consequence for the covered call writer: His optimum scenario tax-wise is a rising market, for he may be able to achieve a long-term gain on the underlying stock if he holds it for at least one year, while simultaneously subtracting short-term losses from written calls that were closed out at higher prices. Unfortunately, in a declining market, the opposite result could occur: short-term option gains coupled with the possibility of a long-term loss on the underlying stock. There are ways to avoid long-term stock losses, such as buying a put (discussed later in the chapter) or going short against the box before the stock becomes long-term. However, these maneuvers would interrupt the covered writing strategy, which may not be a wise tactic.

In summary, then, the covered call writer who finds himself with an in-the-money call written and expiration date drawing near may have several alternatives open to him. If the stock is not yet held long-term, he might elect to buy back the written call and to write another call whose expiration date is beyond the date required for a long-term holding period on the stock. This is apparently what the hypothetical investor in the preceding example did with his October 35 call. Since

that call was in-the-money, he could have elected to let the call be assigned and to take his profit on the position at that time. However, this would have produced a short-term gain, since the stock had not yet been held for one year, so he elected instead to terminate the October 35 call through a closing purchase transaction and to simultaneously write a call whose expiration date exceeded the one year period required to make the stock a long-term item. He thus wrote the January 40 call, expiring in the next year. Note that this investor not only decided to hold the stock for a long-term gain, but also decided to try for more potential profits: He rolled the call up to a higher striking price. This lets the holding period continue. An in-the-money write would have suspended it.

DELIVERING "NEW" STOCK TO AVOID A LARGE LONG-TERM GAIN

Some covered call writers may not want to deliver the stock that they are using to cover the written call, if that call is assigned. For example, if a covered writer were writing against stock that had an extremely low cost basis, he might not be willing to take the tax consequences of selling that particular stock holding. Thus, the writer of a call that is assigned may sometimes wish to buy stock in the open market to deliver against his assignment, rather than deliver the stock he already owns. Recall that it is completely in accordance with the Options Clearing Corporation rules for a call writer to buy stock in the open market to deliver against an assignment. For tax purposes, the confirmation that the investor receives from his broker for the sale of the stock via assignment should clearly specify which particular shares of stock are being sold. This is usually accomplished by having the confirmation read "Versus Purchase" and listing the purchase date of the stock being sold. This is done to clearly identify that the "new" stock, and not the older long-term stock, is being delivered against the assignment. The investor must give these instructions to his broker, so that the brokerage firm puts the proper notation on the confirmation itself. If the investor realizes that his stock might be in danger of being called away and he wants to avail himself of this procedure, he should discuss it with his broker beforehand, so that the proper procedures can be enacted when the stock is actually called away.

Example: An investor owns 100 shares of XYZ and his cost basis, after multiple stock splits and stock dividends over the years, is $2 per share. With XYZ at 50, this investor decides to sell an XYZ July 50 call for 5 points to bring in some income to his portfolio. Subsequently, the call is assigned, but the investor does not want to deliver his XYZ, which he owns at a cost basis of $2 per share, because he would have to pay capital gains on a large profit. He may go into the open market and buy another 100 shares of XYZ at its current market price for delivery against the assignment notice.

Suppose he does this on July 20th, the day he receives the assignment notice on his XYZ July 50 call. The confirmation that he receives from his broker for the sale of 100 XYZ at 50 – that is, the confirmation for the call assignment – should be marked "Versus Purchase July 20th." The year of the sale date should be noted on the confirmation as well. This long-term holder of XYZ stock must, of course, pay for the additional XYZ bought in the open market for delivery against the assignment notice. Thus, it is imperative that such an investor have a reserve of funds that he can fall back on if he thinks that he must ever implement this sort of strategy to avoid the tax consequences of selling his low-cost-basis stock.

PUT EXERCISE

If the put holder does not choose to liquidate the option in the listed market, but instead exercises the put – thereby selling stock at the striking price – the net cost of the put is subtracted from the net sale proceeds of the underlying stock.

Example: Assume an XYZ April 45 put was bought for 2 points. XYZ had declined in price below 45 by April expiration, and the put holder decides to exercise his in-the-money put rather than sell it in the option market. The commission on the stock sale is $85, so the net sale proceeds for the underlying stock would be:

Sale of 100 XYZ at 45 strike ($4,500 – $85)	$4,415
Net cost of put ($200 + 25)	– 225
Net sale proceeds on stock for tax purposes:	$4,190

If the stock sale represents a new position – that is, the investor has shorted the underlying stock – it will eventually be a short-term gain or loss, according to present tax rules governing short sales. If the put holder already owns the underlying stock and is using the put exercise as a means of selling that stock, his gain or loss on the stock transaction is computed, for tax purposes, by subtracting his original net stock cost from the sale proceeds as determined above.

PUT ASSIGNMENT

If a written put is assigned, stock is bought at the striking price. The net cost of this purchased stock is reduced by the amount of the original put premium received.

Example: If one initially sold an XYZ July 40 put for 4 points, and it was assigned, the net cost of the stock would be determined as follows, assuming a $75 commission charge on the stock purchase:

Cost of 100 XYZ assigned at 40 ($4,000 + $75)	$4,075
Net proceeds of put sale ($400 – $25)	– 375
Net cost basis of stock	$3,700

The holding period for stock purchased via a put assignment begins on the day of the put assignment. The period during which the investor was short the put has no bearing on the holding period of the stock. Obviously, the put transaction itself does not become a capital item; it becomes part of the stock transaction.

SPECIAL TAX PROBLEMS

THE WASH SALE RULE

The call buyer should be aware of the wash sale rule. In general, the wash sale rule denies a tax deduction for a security sold at a loss if a substantially identical security, or an option to acquire that security, is purchased within 30 days before or 30 days after the original sale. This means that one cannot sell XYZ to take a tax loss and also purchase XYZ within the 61-day period that extends 30 days before and 30 days after the sale. Of course, an investor can legally make such a trade, he just cannot take the tax loss on the sale of the stock. A call option is certainly an option to acquire the security. *It would thus invoke the wash sale rule for an investor to sell XYZ stock to take a loss and also purchase any XYZ call within 30 days before or after the stock sale.*

Various series of call options are not generally considered to be substantially identical securities, however. If one sells an XYZ January 50 call to take a loss, he may then buy any other XYZ call option without jeopardizing his tax loss from the sale of the January 50. It is not clear whether he could repurchase another January 50 call – that is, an identical call – without jeopardizing the taxable loss on the original sale of the January 50.

It would also be acceptable for an investor to sell a call to take a loss and then immediately buy the underlying security. This would not invoke the wash sale rule.

Avoiding a Wash Sale. It is generally held that the sale of a put is not the acquisition of an option to buy stock, even though that is the effect of assignment of the written put. This fact may be useful in certain cases. If an investor holds a stock at a loss, he may want to sell that stock in order to take the loss on his taxes for the current year. The wash sale rule prevents him from repurchasing the same stock, or a call option on that stock, within 30 days after the sale. Thus, the investor will be "out of" the stock for a month; that is, he will not be

able to participate in any rally in the stock in the next 30 days. If the underlying stock has listed put options, the investor may be able to partially offset this negative effect. By selling an in-the-money put at the same time that the stock is sold, the investor will be able to take his stock loss on the current year's taxes and also will be able to participate in price movements on the underlying stock.

If the stock should rally, the put will decrease in price. However, if the stock rallies above the striking price of the put, the investor will not make as much from the put sale as he would have from the ownership of the stock. Still, he does realize some profits if the stock rallies.

Conversely, if the stock falls in price, the investor will lose on the put sale. This certainly represents a risk – although no more of a risk than owning the stock did. An additional disadvantage is that the investor who has sold a put will not receive the dividends, if any are paid by the underlying stock.

Once 30 days have passed, the investor can cover the put and repurchase the underlying stock. The investor who utilizes this tactic should be careful to select a put sale in which early assignment is minimal. Therefore, he should sell a long-term, in-the-money put when utilizing this strategy. (He needs the in-the-money put in order to participate heavily in the stock's movements.) Note that if stock should be put to the investor before 30 days had passed, he would thus be forced to buy stock, and the wash sale rule would be invoked, preventing him from taking the tax loss on the stock at that time. He would have to postpone taking the loss until he makes a sale that does not invoke the wash sale rule.

Finally, this strategy must be employed in a margin account, because the put sale will be uncovered. Obviously, the money from the sale of the stock itself can be used to collateralize the sale of the put. If the stock should drop in value, it is always possible that additional collateral will be required for the uncovered put.

THE SHORT-SALE RULE – PUT HOLDER'S PROBLEM

A put purchase made by an investor who also owns the underlying stock may have an effect on the holding period of the stock. If a stock holder buys a put, he would normally do so to eliminate some of the downside risk in case the stock falls in price. However, if a put option is purchased to protect stock that is not yet held long enough to qualify for long-term capital gains treatment, the entire holding period of the stock is wiped out. Furthermore, the holding period for the stock will not begin again until the put is disposed of. For example, if an investor has held XYZ for 11 months – not quite long enough to qualify as a long-term holding – and then buys a put on XYZ, he will wipe out the entire accrued holding period on the stock. Furthermore, when he finally disposes of the put, the holding period for the stock must begin all over

again. The previous 11-month holding period is lost, as is the holding period during which the stock and put were held together. This tax consequence of a put purchase is derived from the general rules governing short sales, which state that the acquisition of an option to sell property at a fixed price (that is, a put) is treated as a short sale. This ruling has serious tax consequences for an investor who has bought a put to protect stock that is still in a short-term tax status.

"Married" Put and Stock. There are two cases in which the put purchase does not affect the holding period of the underlying stock. First, if the stock has already been held long enough to qualify for long-term capital treatment, the purchase of a put has no bearing on the holding period of the underlying stock. Second, if the put and the stock that it is intended to protect are bought at the same time, and the investor indicates that he intends to exercise that particular put to sell those particular shares of stock, the put and the stock are considered to be "married" and the normal tax rulings for a stock holding would apply. The investor must actually go through with the exercise of the put in order for the "married" status to remain valid. If he instead should allow the put to expire worthless, he could not take the tax loss on the put itself but would be forced to add the put's cost to the net cost of the underlying stock. Finally, if the investor neither exercises the put nor allows it to expire worthless but sells both the put and the stock in their respective markets, it would appear that the short sale rules would come back into effect.

This definition of "married" put and stock, with its resultant ramifications, is quite detailed. What exactly are the consequences? The "married" rule was originally intended to allow an investor to buy stock, protect it, and still have a chance of realizing a long-term gain. This is possible with options with more than one year of life remaining. The reader must be aware of the fact that, if he initially "marries" stock and a listed 3-month put, for example, there is no way that he can replace that put at its expiration with another put and still retain the "married" status. Once the original "married" put is disposed of – through sale, exercise, or expiration – no other put may be considered to be "married" to the stock.

Protecting a Long-Term Gain or Avoiding a Long-Term Loss. The investor may be able, at times, to use the short-sale aspect of put purchases to his advantage. The most obvious use is that he can protect a long-term gain with a put purchase. He might want to do this if he has decided to take the long-term gain, but would prefer to delay realizing it until the following tax year. A purchase of a put with a maturity date in the following year would accomplish that purpose.

Another usage of the put purchase, for tax purposes, might be to avoid a long-term loss on a stock position. If an investor owns a stock that has declined in price and also is about to become a long-term holding, he can buy a put on that stock to eliminate the holding period. This avoids having to take a long-term loss. Once the put is removed, either by its sale or by its expiring worthless, the stock holding period would begin all over again and it would be a short-term position. In addition, if the investor should decide to exercise the put that he purchased, the result would be a short-term loss. The sale basis of the stock upon exercise of the put would be equal to the striking price of the put less the amount of premium paid for the put, less all commission costs. Furthermore, note that this strategy does not lock in the loss on the underlying stock. If the stock rallies, the investor would be able to participate in that rally, although he would probably lose all of the premium that he paid for the put. Note that both of these long-term strategies can be accomplished via the sale of a deeply in-the-money call as well.

SUMMARY

This concludes the section of the tax chapter dealing with listed option trades and their direct consequences on option strategies. In addition to the basic tax treatment for option traders of liquidation, expiring worthless, or assignment or exercise, several other useful tax situations have been described. The call buyer should be aware of the wash sale rule. The put buyer must be aware of the short sale rules involving both put and stock ownership. The call writer should realize the beneficial effects of selling an in-the-money call to protect the underlying stock, while waiting for a realization of profit in the following tax year. The put writer may be able to avoid a wash sale by utilizing an in-the-money put write, while still retaining profit potential from a rally by the underlying stock.

TAX PLANNING STRATEGIES FOR EQUITY OPTIONS

DEFERRING A SHORT-TERM CALL GAIN

The call holder may be interested in either deferring a gain until the following year or possibly converting a short-term gain on the call into a long-term gain on the stock. It is much easier to do the former than the latter. A holder of a profitable call that is due to expire in the following year can take any of three possible actions that might let him retain his profit while deferring the gain until the following tax year. One way in which to do this would be to buy a put option. Obviously, he would want to buy an

in-the-money put for this purpose. By so doing, he would be spending as little as possible in the way of time value premium for the put option and he would also be locking in his gain on the call. The gains and losses from the put and call combination would nearly equal each other from that time forward as the stock moves up or down, unless the stock rallies strongly, thereby exceeding the striking price of the put. This would be a happy event, however, since even larger gains would accrue. The combination could be liquidated in the following tax year, thus achieving a gain.

Example: On September 1st, an investor bought an XYZ January 40 call for 3 points. The call is due to expire in the following year. XYZ has risen in price by December 1st, and the call is selling for 6 points. The call holder might want to take his 3-point gain on the call, but would also like to defer that gain until the following year. He might be able to do this by buying an XYZ January 50 put for 5 points, for example. He would then hold this combination until after the first of the new year. At that time, he could liquidate the entire combination for at least 10 points, since the striking price of the put is 10 points greater than that of the call. In fact, if the stock should have climbed to or above 50 by the first of the year, or should have fallen to or below 40 by the first of the year, he would be able to liquidate the combination for more than 10 points. The increase in time value premium at either strike would also be a benefit. In any case, he would have a gain – his original cost was 8 points (3 for the call and 5 for the put). Thus, he has effectively deferred taking the gain on the original call holding until the next tax year. The risk that the call holder incurs in this type of transaction is the increased commission charges of buying and selling the put as well as the possible loss of any time value premium in the put itself. The investor must decide for himself whether these risks, although they may be relatively small, outweigh the potential benefit from deferring his tax gain into the next year.

Another way in which the call holder might be able to defer his tax gain into the next year would be to sell another XYZ call against the one that he currently holds. That is, he would create a spread. To assure that he retains as much of his current gain as possible, he should sell an in-the-money call. In fact, he should sell an in-the-money call with a lower striking price than the call held long, if possible, to ensure that his gain remains intact even if the underlying stock should collapse substantially. Once the spread has been established, it could be held until the following tax year before being liquidated. The obvious risk in this means of deferring gain is that one could receive an assignment notice on the short call. This is not a remote possibility, necessarily, since an in-the-money call should be used as protection for the current gain. Such an assignment would result in large commission costs on the resultant purchase and sale of the underlying stock, and could substantially reduce one's gain.

Thus, the risk in this strategy is greater than that in the previous one (buying a put), but it may be the only alternative available if puts are not traded on the underlying stock in question.

Example: An investor bought an XYZ February 50 call for 3 points in August. In December, the stock is at 65 and the call is at 15. The holder would like to "lock in" his 12-point call profit, but would prefer deferring the actual gain into the following tax year. He could sell an XYZ February 45 call for approximately 20 points to do this. If no assignment notice is received, he will be able to liquidate the spread at a cost of 5 points with the stock anywhere above 50 at February expiration. Thus, in the end he would still have a 12-point gain – having received 20 points for the sale of the February 45 and having paid out 3 points for the February 50 plus 5 points to liquidate the spread to take his gain. If the stock should fall below 50 before February expiration, his gain would be even larger, since he would not have to pay out the entire 5 points to liquidate the spread.

The third way in which a call holder could lock in his gain and still defer the gain into the following tax year would be to sell the stock short while continuing to hold the call. This would obviously lock in the gain, since the short sale and the call purchase will offset each other in profit potential as the underlying stock moves up or down. In fact, if the stock should plunge downward, large profits could accrue. However, there is risk in using this strategy as well. The commission costs of the short sale will reduce the call holder's profit. Furthermore, if the underlying stock should go ex-dividend during the time that the stock is held short, the strategist will be liable for the dividend as well. In addition, more margin will be required for the short stock.

The three tactics discussed above showed how to defer a profitable call gain into the following tax year. The gain would still be short-term when realized. The only way in which a call holder could hope to convert his gain into a long-term gain would be to exercise the call and then hold the stock for more than one year. Recall that the holding period for stock acquired through exercise begins on the day of exercise – the option's holding period is lost. If the investor chooses this alternative, he of course is spending some of his gains for the commissions on the stock purchase as well as subjecting himself to an entire year's worth of market risk. There are ways to protect a stock holding while letting the holding period accrue – for example, writing out-of-the-money calls – but the investor who chooses this alternative should carefully weigh the risks involved against the possible benefits of eventually achieving a long-term gain. The investor should also note that he will have to advance considerably more money to hold the stock.

DEFERRING A PUT HOLDER'S SHORT-TERM GAIN

Without going into as much detail, there are similar ways in which a put holder who has a short-term gain on a put due to expire in the following tax year can attempt to defer the realization of that gain into the following tax year. One simple way in which he could protect his gain would be to buy a call option to protect his profitable put. He would want to buy an in-the-money call for this purpose. This resulting combination is similar in nature to the one described for the call buyer in the previous section.

A second way that he could attempt to protect his gain and still defer its realization into the following tax year would be to sell another XYZ put option against the one that he holds long. This would create a vertical spread. This put holder should attempt to sell an in-the-money put, if possible. Of course, he would not want to sell a put that was so deeply in-the-money that there is risk of early assignment. The results of such a spread are analogous to the call spread described in detail in the last section.

Finally, the put holder could buy the underlying stock if he had enough available cash or collateral to finance the stock purchase. This would lock in the profit, as the stock and the put would offset each other in terms of gains or losses while the stock moved up or down. In fact, if the stock should experience a large rally, rising above the striking price of the put, even larger profits would become possible.

In each of the tactics described, the position would be removed in the following tax year, thereby realizing the gain that was deferred.

DIFFICULTY OF DEFERRING GAINS FROM WRITING

As a final point in this section on deferring gains from option transactions, it might be appropriate to describe the risks associated with the strategy of attempting to defer gains from uncovered option writing into the following tax year. Recall that in the previous sections, it was shown that a call or put holder who has an unrealized profit in an option that is due to expire in the following tax year could attempt to "lock in" the gain and defer it. The dollar risks to a holder attempting such a tax deferral were mainly commission costs and/or small amounts of time value premium paid for options. However, the option writer who has an unrealized profit may have a more difficult time finding a way to both "lock in" the gain and also defer its realization into the following tax year. It would seem, at first glance, that the call writer could merely take actions opposite to those that the call buyer takes: buying the underlying stock, buying another call option, or selling a put. Unfortunately, none of these actions "locks in" the call writer's profit. In fact, he could lose substantial investment dollars in his attempt to defer the gain into the following year.

Example: An investor has written an uncovered XYZ January 50 call for 5 points and the call has dropped in value to 1 point in early December. He might want to take the 4-point gain, but would prefer to defer realization of the gain until the following tax year. Since the call write is at a profit, the stock must have dropped and is probably selling around 45 in early December. Buying the underlying stock would not accomplish his purpose, because if the stock continued to decline through year-end, he could lose a substantial amount on the stock purchase and could make only 1 more point on the call write. Similarly, a call purchase would not work well. A call with a lower striking price – for example, the XYZ January 45 or the January 40 – could lose substantial value if the underlying stock continued to drop in price. An out-of-the-money call – the XYZ January 60 – is also unacceptable, because if the underlying stock rallied to the high 50's, the writer would lose money both on his January 50 call write and on his January 60 call purchase at expiration. Writing a put option would not "lock in" the profit either. If the underlying stock continued to decline, the losses on the put write would certainly exceed the remaining profit potential of 1 point in the January 50 call. Alternatively, if the stock rose, the losses on the January 50 call could offset the limited profit potential provided by a put write. Thus, there is no relatively safe way for an uncovered call writer to attempt to "lock in" an unrealized gain for the purpose of deferring it to the following tax year. The put writer seeking to defer his gains faces similar problems.

UNEQUAL TAX TREATMENT ON SPREADS

There are two types of spreads in which the long side may receive different tax treatment than the short side. One is the normal equity option spread that is held for more than one year. The other is any spread between futures, futures options, or cash-based options and equity options.

With equity options, if one has a spread in place for more than one year and if the movement of the underlying stock is favorable, one could conceivably have a long-term gain on the long side and a short-term loss on the short side of the spread.

Example: An investor establishes an XYZ bullish call spread in options that have 15 months of life remaining: In October of one year, he buys the January 70 LEAPS call expiring just over a year in the future. At the same time, he sells the January 80 LEAPS call, again expiring just over a year hence. Suppose he pays 13 for the January 70 call and receives 7 for the January 80 call. In December of the *following* year, he decides to remove the spread, after he has held it for more than one year – specifically, for 14 months in this case. XYZ has advanced by that time, and the spread is worth 9. With XYZ at 90, the January 70 call is trading at 20 and the January 80 call is trading at 11. The capital gain and loss results for tax purposes are summarized in the following table (commissions are omitted from this example):

Option	Cost	Proceeds	Gain/Loss
XYZ January 70 LEAPS call	$1,300	$2,000	$700 long-term gain
XYZ January 80 LEAPS call	$1,100	$ 700	$400 short-term loss

No taxes would be owed on this spread since one-half of the long-term gain is less than the short-term loss. The investor with this spread could be in a favorable position since, even though he actually made money in the spread – buying it at a 6-point debit and selling it at a 9-point credit – he can show a loss on his taxes due to the disparate treatment of the two sides of the spread.

The above spread requires that the stock move in a favorable direction in order for the tax advantage to materialize. If the stock were to move in the opposite direction, then one should liquidate the spread before the long side of the spread had reached a holding period of one year. This would prevent taking a long-term loss.

Another type of spread may be even more attractive in this respect. That is a spread in which nonequity options are spread against equity options. In this case, the trader would hope to make a profit on the nonequity or futures side, because part of that gain is automatically long-term gain. He would simultaneously want to take a loss on the equity option side, because that would be entirely short-term loss.

There is no riskless way to do this, however. For example, one might buy a package of puts on stocks and hedge them by selling an index put on an index that performs more or less in line with the chosen stocks. If the index rises in price, then one would have short-term losses on his stock options, and part of the gain on his index puts would be treated as long-term. However, if the index were to fall in price, the opposite would be true, and long-term losses would be generated – not something that is normally desirable. Moreover, the spread itself has risk, especially the tracking risk between the basket of stocks and the index itself.

This brings out an important point: One should be cautious about establishing spreads merely for tax purposes. He might wind up losing money, not to mention that there could be unfavorable tax consequences. As always, a tax advisor should be consulted before any tax-oriented strategy is attempted.

SUMMARY

Options can be used for many tax purposes. Short-term gains can be deferred into the next tax year, or can be partially protected with out-of-the-money options until they mature into long-term gains. Long-term losses can be avoided with the purchase of a put or sale of a deeply in-the-money call. Wash sales can be avoided without giving up the entire ownership potential of the stock. There are risks as well as rewards

in any of the strategies. Commission costs and the dissipation of time value premium in purchased options will both work against the strategist.

A tax advisor should be consulted before actually implementing any tax strategy, whether that strategy employs options or not. Tax rules change from time to time. It is even possible that a certain strategy is not covered by a written rule, and only a tax advisor is qualified to give consultation on how such a strategy might be interpreted by the IRS.

Finally, the options strategist should be careful not to confuse tax strategies with his profit-oriented strategies. It is generally a good idea to separate profit strategies from tax strategies. That is, if one finds himself in a position that conveniently lends itself to tax applications, fine. However, one should not attempt to stay in a position too long or to close it out at an illogical time just to take advantage of a tax break. The tax consequences of options should never be considered to be more important than sound strategy management.

CHAPTER 42

The Best Strategy?

There is no one best strategy. Although this statement may appear to be unfair and disappointing to some, it is nevertheless the truth. Its validity lies in the fact that there are many types of investors, and no one strategy can be best for all of them. Knowledge and suitability are the keys to determining which strategy may be the best one for an individual. The previous chapters have been devoted to imparting much of the knowledge required to understand an individual strategy. This chapter attempts to point out how the investor might incorporate his own risk/reward attitude and financial condition to select the most feasible strategies for his own use. The final section of this chapter describes which strategies have the better probabilities of success.

GENERAL CONCEPT: MARKET ATTITUDE AND EQUIVALENT POSITIONS

A wide variety of strategies has been described. Certain ones are geared to capitalizing on one's (hopefully correct) outlook for a particular stock, or for the market in general. These tend to be the more aggressive strategies, such as outright put or call buying and low-debit (high-potential) bull and bear spreads. Other strategies are much more conservative, having as their emphasis the possibility of making a reasonable but limited return, coupled with decreased risk exposure. These include covered call writing and in-the-money (large-debit) bull or bear spreads. Even in these strategies, however, one has a general attitude about the market. He is bullish or bearish, but not overly so. If he is proven slightly wrong, he can still make money. However, if he is gravely wrong, relatively large percentage losses might occur. The third broad category of strategies is the one that is not oriented toward picking stock market direction, but is rather an approach based on the value of the option—what

is generally called volatility trading. If the net change in the market is small over a period of time, these strategies should perform well: ratio writing, ratio spreading (especially "delta neutral spreads"), straddle and strangle writing, neutral calendar spreading, and butterfly spreads. On the other hand, if options are cheap and the market is expected to be volatile, then these would be best: straddle and strangle buys, backspreads, and reverse hedges and spreads.

Certain other strategies overlap into more than one of the three broad categories. For example, the bullish or bearish calendar spread is initially a neutral position. It only assumes a bullish or bearish bias after the near-term option expires. In fact, any of the diagonal or calendar strategies whose ultimate aim is to generate profits on the sale of shorter-term options are similar in nature. If these near-term profits are generated, they can offset, partially or completely, the cost of long options. Thus, one might potentially own options at a reduced cost and could profit from a definitive move in his favor at the right time. It was shown in Chapters 14, 23, and 24 that diagonalizing a spread can often be very attractive.

This brief grouping into three broad categories does not cover all the strategies that have been discussed. For example, some strategies are generally to be avoided by most investors: high-risk naked option writing (selling options for fractional prices) and covered or ratio put writing. In essence, the investor will normally do best with a position that has limited risk and the potential of large profits. Even if the profit potential is a low-probability event, one or two successful cases may be able to overcome a series of limited losses. Complex strategies that fit this description are the diagonal put and call combinations described in Chapters 23 and 24. The simplest strategy fitting this description is the T-bill/option purchase program described in Chapter 26.

Finally, many strategies may be implemented in more than one way. The method of implementation may not alter the profit potential, but the percentage risk levels can be substantially different. Equivalent strategies fit into this category.

Example: Buying stock and then protecting the stock purchase with a put purchase is an equivalent strategy in profit potential to buying a call. That is, both have limited dollar risk and large potential dollar profit if the stock rallies. However, they are substantially different in their structure. The purchase of stock and a put requires substantially more initial investment dollars than does the purchase of a call, but the limited dollar risk of the strategy would normally be a relatively small percentage of the initial investment. The call purchase, on the other hand, involves a much smaller capital outlay; in addition, while it also has limited dollar risk, the loss may easily represent the entire initial investment. The stockholder will receive cash dividends while the call holder will not. Moreover, the stock will not expire as the call will. This

provides the stock/put holder with an additional alternative of choosing to extend his position for a longer period of time by buying another put or possibly by just continuing to hold the stock after the original put expires.

Many equivalent positions have similar characteristics. The straddle purchase and the reverse hedge (short stock and buy calls) have similar profit and loss potential when measured in dollars. Their percentage risks are substantially different, however. In fact, as was shown in Chapter 20, another strategy is equivalent to both of these—buying stock and buying several puts. That is, buying a straddle is equivalent to buying 100 shares of stock and simultaneously buying two puts. The "buy stock and puts" strategy has a larger initial dollar investment, but the percentage risk is smaller and the stockholder will receive any dividends paid by the common stock.

In summary, the investor must know two things well: the strategy that he is contemplating using, and his own attitude toward risk and reward. His own attitude represents suitability, a topic that is discussed more fully in the following section. Every strategy has risk. It would not be proper for an investor to pursue the best strategy in the universe (such a strategy does not exist, of course) if the risks of that strategy violated the investor's own level of financial objectives or accepted investment methodology. On the other hand, it is also not sufficient for the investor to merely feel that a strategy is suitable for his investment objectives. Suppose an investor felt that the T-bill/option strategy was suitable for him because of the profit and risk levels. Even if he understands the philosophies of option purchasing, it would not be proper for him to utilize the strategy unless he also understands the mechanics of buying Treasury bills and, more important, the concept of annualized risk.

WHAT IS BEST FOR ME MIGHT NOT BE BEST FOR YOU

It is impossible to classify any one strategy as the best one. The conservative investor would certainly not want to be an outright buyer of options. For him, covered call writing might be the best strategy. Not only would it accomplish his financial aims—moderate profit potential with reduced risk—but it would be much more appealing to him psychologically. The conservative investor normally understands and accepts the risks of stock ownership. It is only a small step from that understanding to the covered call writing strategy. The aggressive investor would most likely not consider covered call writing to be the best strategy, because he would consider the profit potential too small. He is willing to take larger risks for the opportunity to make larger profits. Outright option purchases might suit him best, and he would accept, by his aggressive stature, that he could lose nearly all his money in a relatively short time

period. (Of course, one would hope that he uses only 15 to 20% of his assets for speculative option buying.)

Many investors fit somewhere in between the conservative description and the aggressive description. They might want to have the opportunity to make large profits, but certainly are not willing to risk a large percentage of their available funds in a short period of time. Spreads might therefore appeal to this type of investor, especially the low-debit bullish or bearish calendar spreads. He might also consider occasional ventures into other types of strategies—bullish or bearish spreads, straddle buys or writes, and so on—but would generally not be into a wide range of these types of positions. The T-bill/option strategy might work well for this investor also.

The wealthy aggressive investor may be attracted by strategies that offer the opportunity to make money from credit positions, such as straddle or combination writing. Although ratio writing is not a credit strategy, it might also appeal to this type of investor because of the large amounts of time value premium that are gathered in. These are generally strategies for the wealthier investor because he needs the "staying power" to be able to ride out adverse cycles. If he can do this, he should be able to operate the strategy for a sufficient period of time in order to profit from the constant selling of time value premiums.

In essence, the answer to the question of "which strategy is best" again revolves around that familiar word, "suitability." *The financial needs and investment objectives of the individual investor are more important than the merits of the strategy itself.* It sounds nice to say that he would like to participate in strategies with limited risk and potentially large profits. Unfortunately, if the actual mechanics of the strategy involve risk that is not suitable for the investor, he should not use the strategy, no matter how attractive it sounds.

Example: The T-bill/option strategy seems attractive: limited risk because only 10% of one's assets are subjected to risk annually; the remaining 90% of one's assets earn interest; and if the option profits materialize, they could be large. What if the worst scenario unfolds? Suppose that poor option selections are continuously made and there are three or four years of losses, coupled with a declining rate of interest earned from the Treasury bills (not to mention the commission charges for trading the securities). The portfolio might have lost 15 or 20% of its assets over those years. *A good test of suitability is for the investor to ask himself, in advance: "How will I react if the worst case occurs?"* If there will be sleepless nights, pointing of fingers, threats, and so forth, the strategy is unsuitable. If, on the other hand, the investor believes that he would be disappointed (because no one likes to lose money), but that he can withstand the risk, the strategy may indeed be suitable.

MATHEMATICAL RANKING

The discussion above demonstrates that it is not possible to ultimately define the best strategy when one considers the background, both financial and psychological, of the individual investor. However, the reader may be interested in knowing which strategies have the best mathematical chances of success, regardless of the investor's personal feelings. Not unexpectedly, *strategies that take in large amounts of time value premium have high mathematical expectations.* These include ratio writing, ratio spreading, straddle writing, and naked call writing (but only if the "rolling for credits" follow-up strategy is adhered to). The ratio strategies would have to be operated according to a delta-neutral ratio in order to be mathematically optimum. Unfortunately, these strategies are not for everyone. All involve naked options, and also require that the investor have a substantial amount of money (or collateral) available to make the strategies work properly. Moreover, naked option writing in any form is not suitable for some investors, regardless of their protests to the contrary.

Another group of strategies that rank high on an expected profit basis are those that have limited risk with the potential of occasionally attaining large profits. The T-bill/option strategy is a prime example of this type of strategy. The strategies in which one attempts to reduce the cost of longer-term options through the sale of near-term options fit in this broad category also, although one should limit his dollar commitment to 15 to 20% of his portfolio. Calendar spreads such as the combinations described in Chapter 23 (calendar combination, calendar straddle, and diagonal butterfly spread) or bullish call calendar spreads or bearish put calendar spreads are all examples of such strategies. These strategies may have a rather frequent probability of losing a small amount of money, coupled with a low probability of earning large profits. Still, a few large profits may be able to more than overcome the frequent, but small, losses. *Ranking behind these strategies are the ones that offer limited profits with a reasonable probability of attaining that profit.* Covered call writing, large debit bull or bear spreads (purchased option well in-the-money and possible written option as well), neutral calendar spreads, and butterfuly spreads fit into this category.

Unfortunately, all these strategies involve relatively large commission costs. Even though these are not strategies that normally require a large investment, the investor who wants to reduce the percentage effect of commissions must take larger positions and will therefore be advancing a sizable amount of money.

Speculative buying and spreading strategies rank the lowest on a mathematical basis. The T-bill/option strategy is not a speculative buying strategy. In-the-money purchases, including the in-the-money combination, generally outrank out-of-the-money purchases. This is because one has the possibility of making a large percentage profit but has decreased the chance of losing all his investment, since he starts

out in-the-money. In general, however, the constant purchase of time value premiums, which must waste away by the time the options expire, will have a burdensome negative effect. The chances of large profits and large losses are relatively equal on a mathematical basis, and thus become subsidiary to the time premium effect in the long run. This mathematical outlook, of course, precludes those investors who are able to predict stock movements with an above-average degree of accuracy. Although the true mathematical approach holds that it is not possible to accurately predict the market, there are undoubtedly some who can and many who try.

SUMMARY

Mathematical expectations for a strategy do not make it suitable even if the expected returns are good, for the improbable may occur. Profit potentials also do not determine suitability; risk levels do. In the final analysis, one must determine the suitability of a strategy by determining if he will be able to withstand the inherent risks if the worst scenario should occur. For this reason, no one strategy can be designated as the best one, because there are numerous attitudes regarding the degree of risk that is acceptable.

Postscript

Option strategies cannot be unilaterally classified as aggressive or conservative. There are certainly many aggressive applications, the simplest being the outright purchase of calls or puts. However, options can also have conservative applications, most notably in reducing some of the risks of common stock ownership. In addition, there are less polarized applications, particularly spreading techniques, that allow the investor to take a middle-of-the-road approach.

Consequently, *the investor himself—not options—becomes the dominant force in determining whether an option strategy is too risky.* It is imperative that the investor understand what he is trying to accomplish in his portfolio before actually implementing an option strategy. Not only should he be cognizant of the factors that go into determining the initial selection of the position, but he must also have in mind a plan of follow-up action. If he has thought out, in advance, what action he will take if the underlying entity rises or falls, he will be in a position to make a more rational decision when and if it does indeed make a move. The investor must also determine if the risk of the strategy is acceptable according to his financial means and objectives. If the risk is too high, the strategy is not suitable.

Every serious investor owes it to himself to acquire an understanding of listed option strategies. Since various options strategies are available for a multitude of purposes, *almost every money manager or dedicated investor will be able to use options in his strategies at one time or another.* For a stock-oriented investor to ignore the potential advantages of using options would be as serious a mistake as it would be for a large grain company to ignore the hedging properties available in the futures market, or as it would be for an income-oriented investor to concentrate only in utilities and Treasury bills while ignoring less well known, but equally compatible, alternatives such as GNMAs.

Moreover, in today's markets, with options being available on futures, equities, and indices, the strategist in any one field should familiarize himself with the others, because any of them will provide profit opportunities at one time or another.

PART VII

Appendices

APPENDIX A

Strategy Summary

Except for arbitrage strategies and tax strategies, the strategies we have described deal with risk of market movement. It is therefore often convenient to summarize option strategies by their risk and reward characteristics and by their market outlook—bullish, bearish, or neutral. Table A-1 lists all the risk strategies that were discussed and gives a general classification of their risks and rewards. If a strategist has a definite attitude about the market's outlook or about his own willingness to accept risks, he can scan Table A-1 and select the strategies that most closely resemble his thinking. The number in parentheses after the strategy name indicates the chapter in which the strategy was discussed.

Table A-1 gives a *broad* classification of the various risk and reward potentials of the strategies. For example, a bullish call calendar spread does not actually have unlimited profit potential unless its near-term call expires worthless. In fact, *all calendar spread or diagonal spread positions have limited profit potential at best until the near-term options expire.*

Also, the definition of limited risk can vary widely. Some strategies do have a risk that is truly limited to a relatively small percentage of the initial investment—the protected stock purchase, for example. *In other cases, the risk is limited but is also equal to the entire initial investment.* That is, one could lose 100% of his investment in a short time period. Option purchases and bull, bear, or calendar spreads are examples.

Thus, although Table A-1 gives a broad perspective on the outlook for various strategies, one must be aware of the differences in reward, risk, and market outlook when actually implementing one of the strategies.

TABLE A-1.
General strategy summary.

Strategy (Chapter)	Risk	Reward
Bullish strategies		
Call purchase (3)	Limited	Unlimited
Synthetic long stock (short put/long call) (21)	Unlimited[a]	Unlimited
Bull spread—puts or calls (7 and 22)	Limited	Limited
Protected stock purchase (long stock/long put) (17)	Limited	Unlimited
Bullish call calendar spread (9)	Limited	Unlimited
Covered call writing (2)	Unlimited[a]	Limited
Uncovered put write (19)	Unlimited[a]	Limited
Bearish Strategies		
Put purchase (16)	Limited	Unlimited[a]
Protected short sale (synthetic put) (4 and 16)	Limited	Unlimited[a]
Synthetic short sale (long put/short call) (21)	Unlimited	Unlimited[a]
Bear spread—put or call (and 22)	Limited	Limited
Covered put write (19)	Unlimited	Limited
Bearish put calendar spread (22)	Limited	Unlimited[a]
Naked call write (5)	Unlimited	Limited
Neutral strategies		
Straddle purchase (18)	Limited	Unlimited
Reverse hedge (simulated straddle buy) (4)	Limited	Unlimited
Fixed income + option purchase (25)	Limited	Unlimited
Diagonal spread (14, 23, and 24)	Limited	Unlimited
Neutral calendar spread—puts or calls (9 and 22)	Limited	Limited
Butterfly spread (10 and 23)	Limited	Limited
Calendar straddle or combination (23)	Limited	Unlimited
Reverse spread (13)	Limited	Unlimited
Ratio write—put or call (6 and 19)	Unlimited	Limited
Straddle or combination write (20)	Unlimited	Limited
Ratio spread—put or call (11 and 24)	Unlimited	Limited
Ratio calendar spread—put or call (12 and 24)	Unlimited	Unlimited

[a]Wherever the risk or reward is limited only by the fact that a stock cannot fall below zero in price, the entry is marked. Obviously, although the potential may technically be limited, it could still be quite large if the underlying stock did fall a large distance.

APPENDIX B

Equivalent Positions

Some strategies can be constructed with either puts or calls to attain the same profit potential. These are called equivalent strategies and are given in Table B-1. They do not necessarily have the same potential returns, because the investment required may be quite different. However, equivalent positions have profit graphs with exactly the same shape.

Other equivalences can be determined by combining any two strategies in the left-hand column and setting that combination equivalent to the two corresponding strategies in the right-hand column.

TABLE B-1.
Equivalent strategies.

This Strategy	is equivalent to	This Strategy
Call purchase		Long stock/long put
Put purchase		Short stock/long call (synthetic put)
Long stock		Long call/short put (synthetic stock)
Short stock		Long put/short call (synthetic short sale)
Naked call write		Short stock/short put
Naked put write		Covered call write (long stock/short call)
Bullish call spread (long call at lower strike/ short call at higher strike)		Bullish put spread (long put at lower strike/ short put at higher strike)
Bearish call spread (long call at higher strike/ short call at lower strike)		Bearish put spread (long put at higher strike/ short put at lower strike)
Ratio call write (long stock/short calls)		Straddle write (short put/short call)
... and is also equivalent to ...		Ratio put write (short stock/short puts)
Straddle buy (long call/long put)		Reverse hedge (short stock/long calls) *or* buy stock/buy puts
Butterfly call spread (long 1 call at each outside strike/ short 2 calls at middle strike)		Butterfly put spread (long one put at each outer strike/ short two calls at middle strike)
	All four of these "butterfly" strategies are equivalent	
Butterfly combination (bullish call spread at two lower strikes/bearish put spread at two higher strikes)		Protected straddle write (short straddle at middle strike/ long call at highest strike/ long put at lowest strike

APPENDIX C

Formulae

Chapter references are given in parentheses. The following notation is used throughout this appendix.

x = current stock price
s = striking price
c = call price
p = put price
r = interest rate
t = time (in years)
B = break-even point
U = upside break-even point
D = downside break-even point
P = maximum profit potential
R = maximum risk potential

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

Annualized Risk (Ch. 26)

$$\text{Annualized risk} = \sum_i \text{INV}_i \frac{360}{\text{H}_i}$$

where INV_i = percent of total assets invested in options with holding periods, H_i

H_i = length of holding period in days

Bear Spread

$s_1 < s_2$

—Calls (Ch. 8)

$$P = c_1 - c_2$$

$$R = s_2 - s_1 - P$$

$$B = s_1 + P$$

—Puts (Ch. 22)

$$R = p_2 - p_1$$

$$P = s_2 - s_1 - R$$

$$B = s_1 + P = s_2 + p_1 - p_2$$

Black Model (Ch. 34):

Theoretical futures call price = $e^{-rt} \times \text{BSM}[r = 0\%]$

where $\text{BSM}[r = 0)$ is the Black–Scholes Model using $r = 0\%$ as the short-term interest rate

Put price = Call price – $e^{-rt} \times (f - s)$

where f = futures price

x	=	current stock price	B	=	break-even point
s	=	striking price	U	=	upside break-even point
c	=	call price	D	=	downside break-even point
p	=	put price	P	=	maximum profit potential
r	=	interest rate	R	=	maximum risk potential
t	=	time (in years)			
f	=	futures price			

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

Black–Scholes Model (Ch. 28)

$$\text{Theoretical call price} = xN(d_1) - se^{-rt}N(d_2)$$

$$\begin{aligned}
\text{where } d_1 &= \frac{\ln(x/s) + (r + {}^1\!/{}_2 v^2)t}{v\sqrt{t}} \\
\text{and } d_2 &= d_1 - v\sqrt{t} \\
\ln &= \text{natural logarithm} \\
N() &= \text{cumulative normal density function} \\
v &= \text{annual volatility} \\
\text{Delta} &= N(d_1)
\end{aligned}$$

Bull Spread

$s_1 < s_2$

—Calls (Ch. 7)

$$R = c_1 - c_2$$

$$P = s_2 - s_1 - R$$

$$B = s_2 - P = s_1 - c_2 + c_1$$

—Puts (Ch. 22)

$$P = p_2 - p_1$$

$$R = s_2 - s_1 - P$$

$$B = s_2 - P$$

Butterfly Spread

A butterfly spread combines a bull spread using strikes s_1 and s_2 with a bear spread using strikes s_2 and s_3.

$s_1 < s_2 < s_3$

$s_3 - s_2 = s_2 - s_1$

—if using all calls (Ch. 10)

$$R = c_1 + c_3 - 2c_2$$

—if using all puts (Ch. 23)

$$R = p_1 + p_2 - 2p_2$$

—if using put bull spread and call bear spread (Ch. 23)

$$P = c_2 + p_2 - c_3 - p_1$$

—if using call bull spread and put bear spread (Ch. 23)

$$R = p_2 + c_2 - p_1 - c_3 - s_3 + s_2$$

Then

$$P = s_3 - s_2 - R \text{ or } R = s_3 - s_2 - P$$

$$D = s_1 + R$$

$$U = s_3 - R$$

Combination Buy (Ch. 18)

$s_1 < s_2$

Out-of-the-money: $R = c_2 + p_1$

In-the-money: $R = c_1 + p_2 - s_2 + s_1$

$$D = s_1 - P$$

$$U = s_2 + P$$

Combination Sale (Ch. 20)

$s_1 < s_2$

Out-of-the-money: $P = c_2 + p_1$

In-the-money: $P = c_1 + p_2 - s_2 + s_1$

$$D = s_1 - P$$

$$U = s_2 + P$$

---

x = current stock price
s = striking price
c = call price
p = put price
r = interest rate
t = time (in years)
f = futures price
B = break-even point
U = upside break-even point
D = downside break-even point
P = maximum profit potential
R = maximum risk potential

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

—if using call bull spread and put bear spread (Ch. 23)

$$R = p_2 + c_2 - p_1 - c_3 - s_3 + s_2$$

Then

$$P = s_3 - s_2 - R \text{ or } R = s_3 - s_2 - P$$

$$D = s_1 + R$$

$$U = s_3 - R$$

Combination Buy (Ch. 18)

$s_1 < s_2$

Out-of-the-money: $R = c_2 + p_1$

In-the-money: $R = c_1 + p_2 - s_2 + s_1$

$$D = s_1 - P$$

$$U = s_2 + P$$

Combination Sale (Ch. 20)

$s_1 < s_2$

Out-of-the-money: $P = c_2 + p_1$

In-the-money: $P = c_1 + p_2 - s_2 + s_1$

$$D = s_1 - P$$

$$U = s_2 + P$$

---

x	=	current stock price	B	=	break-even point
s	=	striking price	U	=	upside break-even point
c	=	call price	D	=	downside break-even point
p	=	put price	P	=	maximum profit potential
r	=	interest rate	R	=	maximum risk potential
t	=	time (in years)			
f	=	futures price			

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

—if using call bull spread and put bear spread (Ch. 23)

$$R = p_2 + c_2 - p_1 - c_3 - s_3 + s_2$$

Then

$$P = s_3 - s_2 - R \text{ or } R = s_3 - s_2 - P$$

$$D = s_1 + R$$

$$U = s_3 - R$$

Combination Buy (Ch. 18)

$s_1 < s_2$

Out-of-the-money: $R = c_2 + p_1$

In-the-money: $R = c_1 + p_2 - s_2 + s_1$

$$D = s_1 - P$$

$$U = s_2 + P$$

Combination Sale (Ch. 20)

$s_1 < s_2$

Out-of-the-money: $P = c_2 + p_1$

In-the-money: $P = c_1 + p_2 - s_2 + s_1$

$$D = s_1 - P$$

$$U = s_2 + P$$

x = current stock price
s = striking price
c = call price
p = put price
r = interest rate
t = time (in years)
f = futures price
B = break-even point
U = upside break-even point
D = downside break-even point
P = maximum profit potential
R = maximum risk potential

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

Conversion and Reversal Profit (Ch. 27)

Conversion: $P = s + c - x - p$ + dividends – carrying cost

Reversal: $P = x + p - c - s$ – dividends + carrying cost

where

$$\text{carrying cost} = \begin{cases} srt \text{ (simple interest)} \\ s[1-(1+r)^{-t}] \text{ (compound interest, present worth)} \end{cases}$$

Covered Call Write (Ch. 2)

$P = s + c - x$

$B = x - c$

Covered Straddle Write (Ch. 20)

$P = s + c + p - x$

$B = s - {}^{1}\!/_{2}P = {}^{1}\!/_{2}(x + s - p - c)$

Cumulative Normal Density Function (Ch. 28)

Approximation by fifth-order polynomial

$$a = 1 - z(1.330274y^5 - 1.821256y^4 + 1.781478y^3 - .3565638y^2 + .3193815y)$$

where $y = \dfrac{1}{1 + .2316419|\sigma|}$

$z = .3989423e^{-\sigma^2/2}$

Then

$$N(\sigma) = \begin{cases} a & \text{if } \sigma > 0 \\ 1 - a & \text{if } \sigma < 0 \end{cases}$$

Delta—see Black–Scholes Model

Delta Neutral Ratio:

—stock versus option (Ch. 6)

$$\text{Neutral ratio} = \frac{1}{\text{Delta of option}}$$

—spread (Chs. 11 and 24)

$$\text{Neutral ratio} = \frac{\text{Delta of long option}}{\text{Delta of short option}}$$

Equivalent Futures Position (Ch. 34]

$$\text{EFP} = \text{Delta} \times \text{Number of options}$$

Equivalent Stock Position (Ch. 28]

$$\text{ESP} = \text{Unit of trading} \times \text{Delta} \times \text{number of options}$$

where unit of trading is the number of shares of the underlying stock that can be bought or sold with the option (normally 100).

Futures Contract Fair Value (Ch. 29)

—*Stock index futures*

$$\text{Index value} \times (1 + rt) + \text{Present worth (dividends)}$$

Also see *Present worth.*

Future Stock Price (Ch. 28)

—lognormal distribution, assuming a movement of a fixed number of standard deviations

$$q = xe^{av_t}$$

where

q = future stock price
v_t = volatility for the time period
a = number of standard deviations of movement (normally $-3.0 \le a \le 3.0$)

Gamma (Ch. 40)

$$\text{let } z = \ln\left[\frac{x}{s \times (1 + r)^t}\right] \Big/ v\sqrt{t} + \frac{v\sqrt{t}}{2}$$

Then

$$\Gamma = \frac{e^{(-x^2/2)}}{xv\sqrt{2\pi t}}$$

x	=	current stock price	B	=	break-even point
s	=	striking price	U	=	upside break-even point
c	=	call price	D	=	downside break-even point
p	=	put price	P	=	maximum profit potential
r	=	interest rate	R	=	maximum risk potential
t	=	time (in years)			

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

Probability of Stock Movement (Ch. 28)

—lognormal distribution

$$\text{P(below } q) = N\left\{\frac{\ln(/q/x)}{v_t}\right\}$$

$$\text{P(above } q) = 1 - \text{P(below } q)$$

where

q = stock price in question
$N()$ = cumulative normal density function
ln = natural logarithm
v_t = volatility for the time period

Present Worth of a Future Amount (Ch. 28)

$$\text{Present worth} = \frac{\text{Future amount}}{(1 + r)^t}$$

Put Pricing Model—Arbitrage Model (Ch. 28)

Theoretical put price = Theoretical call price + $s - x$ + dividends – carrying cost

where

$$\text{carrying cost} = \begin{cases} srt \text{ (simple interest)} \\ s\,[1 - (1 + r)^{-t}] \text{ (compound interest, present worth)} \end{cases}$$

Ratio Call Write (Ch. 6)

General case: long m round lots of stock, short n calls

$$P = m(s - x) + nc$$
$$U = s + \frac{P}{n - m}$$
$$D = s - \frac{P}{m}$$

2:1 ratio (straddle sale)

$$P = s - x + 2c$$
$$U = s + p$$
$$D = s - p = x - 2c$$

Ratio Spread

—*Calls* (Ch. 11): buy n_1 calls at lower strike, s_1, and sell n_2 calls at higher strike, s_2

$$s_1 < s_2$$
$$n_1 < n_2$$
$$R = n_1c_1 - n_2c_2$$
$$P = (s_2 - s_1)n_1 - R$$
$$U = s_2 + \frac{P}{n_2 - n_1}$$

Break-even cost of long calls for follow-up action (Ch. 11)

$$\text{Break-even cost} = \frac{n_2(s_2 - s_1) - R}{n_2 - n_1}$$

—Puts (Ch. 24): buy n_2 puts at higher strike, s_2, and sell n_1 puts at lower strike, s_1

$$s_1 < s_2$$
$$n_2 < n_1$$
$$R = n_2p_2 - n_1p_1$$
$$\mathrm{P} = n_2(s_2 - s_1) - R$$
$$\mathrm{D} = s_1 - \frac{P}{n_1 - n_2}$$

Reversal—See Conversion and Reversal Profit

Reverse Hedge (Ch. 4)—simulated straddle purchase

General case: short m round lots of stock and long n calls

$$R = m(s - x) + nc$$
$$U = s + \frac{R}{n - m}$$
$$D = s - \frac{R}{m}$$

x	=	current stock price	B	=	break-even point
s	=	striking price	U	=	upside break-even point
c	=	call price	D	=	downside break-even point
p	=	put price	P	=	maximum profit potential
r	=	interest rate	R	=	maximum risk potential
t	=	time (in years)			

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

2:1 ratio (straddle buy):

$$R = s + 2c - x$$

$$U = s + R$$

$$D = s - R = x - 2c$$

Using puts (long 100 stock, long 2 puts) (Ch. 18)

$$R = x + 2p - s$$

$$U = s + R = x + 2p$$

$$D = s - R$$

Straddle Buy (Ch. 18)

$$R = p + c$$

$$U = s + R$$

$$D = -R$$

Straddle Sale (Ch. 20)

$$P = p + c$$

$$U = s + p$$

$$D = s - p$$

Synthetic Put Purchase—short stock and long call (Ch. 4)

$$R = s + c - x$$

$$B = s - c$$

Variable Ratio Write (Ch. 6)

—long 100 shares of stock, short one call at strike s_1, short one call at strike s_2

$s_1 < x < s_2$

$$P = c_1 + c_2 + s_1 - x$$

$$D = s_1 - P = x - c_1 - c_2$$

$$U = s_2 + P$$

Ratio Spread

—*Calls* (Ch. 11): buy n_1 calls at lower strike, s_1, and sell n_2 calls at higher strike, s_2

$$s_1 < s_2$$
$$n_1 < n_2$$
$$R = n_1c_1 - n_2c_2$$
$$P = (s_2 - s_1)n_1 - R$$
$$U = s_2 + \frac{P}{n_2 - n_1}$$

Break-even cost of long calls for follow-up action (Ch. 11)

$$\text{Break-even cost} = \frac{n_2(s_2 - s_1) - R}{n_2 - n_1}$$

—Puts (Ch. 24): buy n_2 puts at higher strike, s_2, and sell n_1 puts at lower strike, s_1

$$s_1 < s_2$$
$$n_2 < n_1$$
$$R = n_2p_2 - n_1p_1$$
$$\text{P} = n_2(s_2 - s_1) - R$$
$$\text{D} = s_1 - \frac{P}{n_1 - n_2}$$

Reversal—See Conversion and Reversal Profit

Reverse Hedge (Ch. 4)—simulated straddle purchase

General case: short m round lots of stock and long n calls

$$R = m(s - x) + nc$$
$$U = s + \frac{R}{n - m}$$
$$D = s - \frac{R}{m}$$

---

x	=	current stock price	B	=	break-even point
s	=	striking price	U	=	upside break-even point
c	=	call price	D	=	downside break-even point
p	=	put price	P	=	maximum profit potential
r	=	interest rate	R	=	maximum risk potential
t	=	time (in years)			

Subscripts indicate multiple items. For example s_1, s_2, s_3 would designate three striking prices in a formula. The formulae are arranged alphabetically by title or by strategy.

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Straddle Buy (Ch. 18)

$$R = p + c$$

$$U = s + R$$

$$D = -R$$

Straddle Sale (Ch. 20)

$$P = p + c$$

$$U = s + p$$

$$D = s - p$$

Synthetic Put Purchase—short stock and long call (Ch. 4)

$$R = s + c - x$$

$$B = s - c$$

Variable Ratio Write (Ch. 6)

—long 100 shares of stock, short one call at strike s_1, short one call at strike s_2

$s_1 < x < s_2$

$$P = c_1 + c_2 + s_1 - x$$

$$D = s_1 - P = x - c_1 - c_2$$

$$U = s_2 + P$$

Volatility—Standard Deviation (Ch. 28)

$$v_2 = \frac{\sum_{i=1}^{n} (x_i - \overline{x})^2}{n-1}$$

Where

x_i = daily stock closing price
x = mean (average) of the x_i's
n = number of observations
—if v is the annual volatility, then the volatility for a time period, t, is

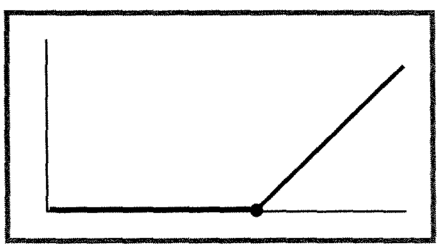
$$v_t = v\sqrt{t}$$

APPENDIX D

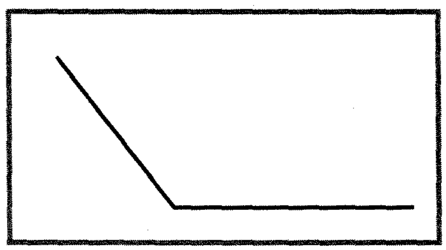
Graphs

Chapter references are in parentheses.

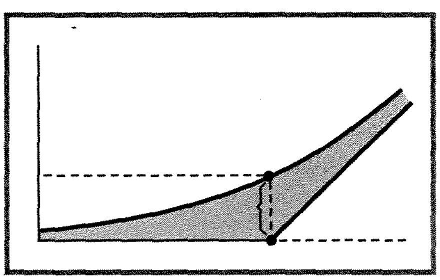
A. Intrinsic Value—Call (Ch. 1)



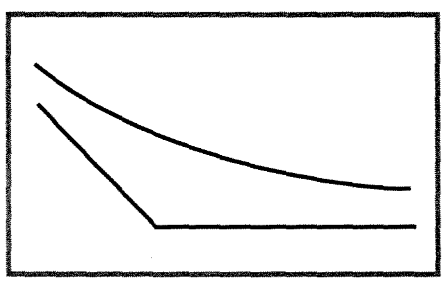
B. Intrinsic Value—Put (Ch. 15)



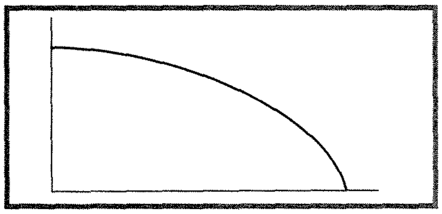
C. Call Option Pricing Curve
(Ch. 1)



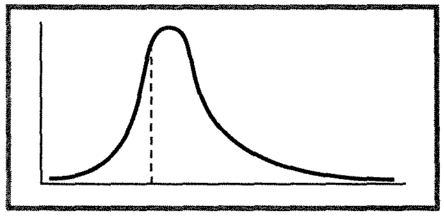
D. Put Option Pricing Curve
(Ch. 15)



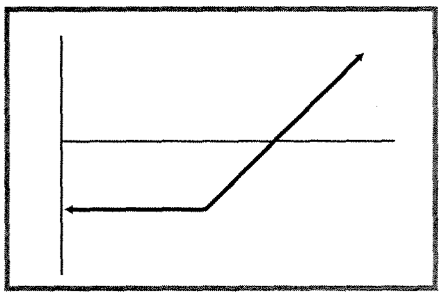
E. Time Value Premium Decay (Ch. 1)



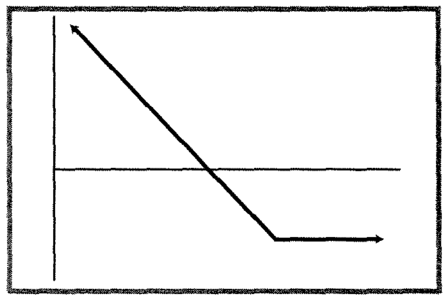
F. Lognormal Distribution (Ch. 28)



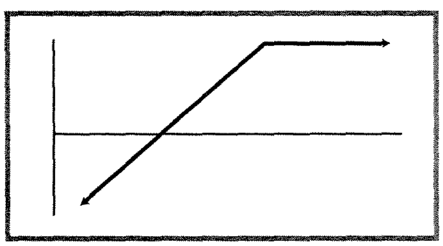
G. Call Purchase (Ch. 1) (long stock/long put—Ch. 17)



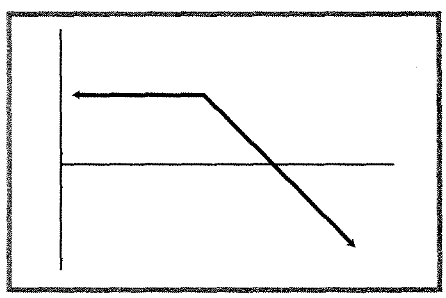
H. Put Purchase (Ch. 16) (short stock/long call—Ch. 4)



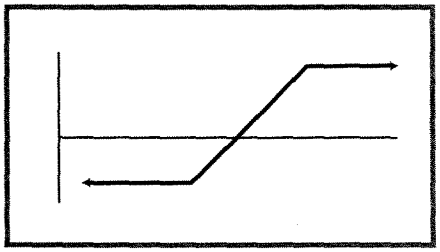
I. Covered Call Write (Ch. 2) Naked Put Write (Ch. 19)



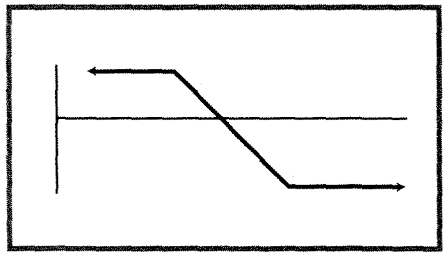
J. Naked Call Write (Ch. 5) (short stock/short put—Ch. 19)



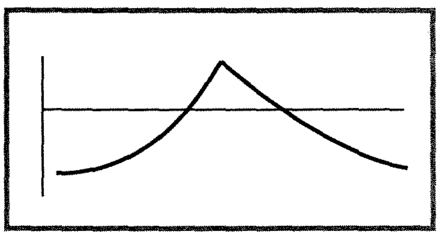
K. Bull Spread (Chs. 7 and 22)
(covered call write + long put out-of-the-money—Ch. 17)



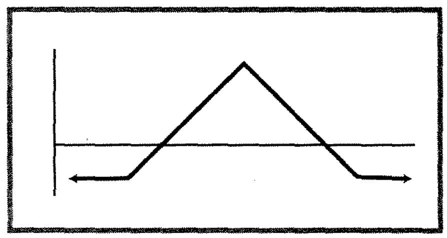
L. Bear Spread (Chs. 8 and 22)



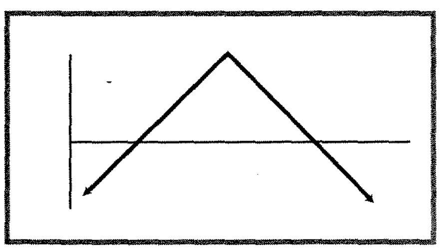
M. Calendar Spread (Chs. 9 and 22)



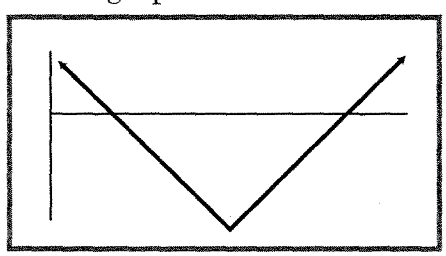
N. Butterfly Spread (Chs. 10 and 23)



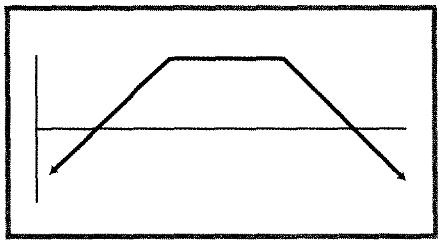
O. Naked Straddle Write (Ch. 20)
Ratio Call Write (long 100 stock, short 2 calls—Ch. 6)
Ratio Put Write (short 100 stock, short 2 puts—Ch. 19)



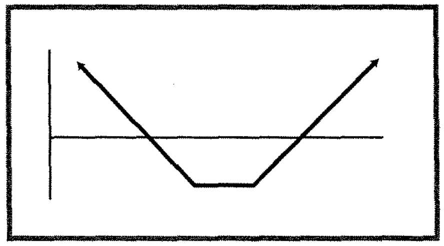
P. Straddle Purchase (Ch. 18)
Reverse hedge (short 100 stock, long 2 calls—Ch. 4)
Put Hedge (long 100 stock, long 2 puts—Ch. 18)



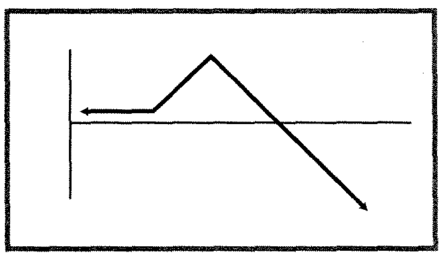
Q. Combination Sale (Ch. 20)
Variable Ratio Write (long 100 stock, short 2 calls with different strikes—Ch. 6)



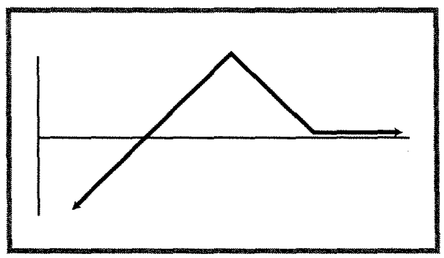
R. Combination Purchase (Ch. 18)
(short 100 stock, long 2 calls with different strikes—Ch. 4)



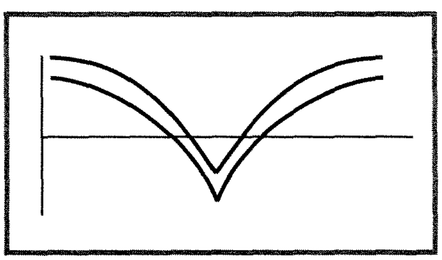
S. Ratio Call Spread (Ch. 11)



T. Ratio Put Spread (Ch. 24)



U. Reverse Calendar Spread (Ch. 13)



APPENDIX E

Qualified Covered Calls

For tax purposes, there is no effect on the holding period of the stock when one writes an out-of-the-money call. However, when one writes an in-the-money call, he eliminates the holding period on his common stock unless the stock is already held long-term. The only exception to this is that if the covered call is deemed to be qualified, then the holding period is merely suspended rather than eliminated. Table E-1 shows the lowest striking price that may be written if the stock is in the price range shown.

TABLE E-1.
Qualified covered call options.

Applicable Stock Price[1]	Call is not "deep-in-the-money" if Strike Price[2] is at least:		Applicable Stock Price[1]	Call is not "deep-in-the-money" if Strike Price[2] is at least:	
	31–90-Day Call	More than 90-Day Call		31–90-Day Call	More than 90-Day Call
5.13–5.88	5	5	75.13–80	75	70
6–10	None	None	80.13–85	80	75
10.13–11.75	10	10	85.13–90	85	80
11.88–15	None	None	90.13–95	90	85
15.13–17.63	15	15	95.13–100	95	90
17.75–20	None	None	100.13–105	100	95
20.13–23.50	20	20	105.13–110	100	100
23.63–25	None	None	110.13–120	110	110
25.13–30	25	25	120.13–130	120	120
30.13–35	30	30	130.13–140	130	130
35.13–40	35	35	140.13–150	140	140
40.13–45	40	40	150.13–160	150	140
45.13–50	45	45	160.13–170	160	150
50.13–55	50	50	170.13–180	170	160
55.13–60	55	55	180.13–190	180	170
60.13–65	60	55	190.13–200	190	180
65.13–70	65	60	200.13–210	200	190
70.13–75	70	65	210.13–220	210	200

[1] Applicable stock price is either the closing price of the stock on the day preceding the date the option was granted, or the opening price on the day the option is granted if such price is greater than 100% of the preceding day's closing price.

[2] Assumption is that strike prices are only at $5 intervals up to $100 and $10 intervals over $100. *Note:* If the stock splits, option strike prices will have smaller intervals for a period of time.

Glossary

American Exercise: a feature of an option that indicates it may be exercised at any time. Therefore, it is subject to early assignment.

Arbitrage: the process in which professional traders simultaneously buy and sell the same or equivalent securities for a riskless profit. *See also* Risk Arbitrage.

Assign: to designate an option writer for fulfillment of his obligation to sell stock (call option writer) or buy stock (put option writer). The writer receives an assignment notice from the Options Clearing Corporation. *See also* Early Exercise.

Assignment Notice: *see* Assign.

Automatic Exercise: a protection procedure whereby the Options Clearing Corporation attempts to protect the holder of an expiring in-the-money option by automatically exercising the option on behalf of the holder.

Average Down: to buy more of a security at a lower price, thereby reducing the holder's average cost. (Average Up: to buy more at a higher price.)

Backspread: see Reverse Strategy.

Bear Spread: an option strategy that makes its maximum profit when the underlying stock declines and has its maximum risk if the stock rises in price. The strategy can be implemented with either puts or calls. In either case, an option with a higher striking price is purchased and one with a lower striking price is sold, both options generally having the same expiration date. *See also* Bull Spread.

Bearish: an adjective describing an opinion or outlook that expects a decline in price, either by the general market or by an underlying stock, or both. *See also* Bullish.

Beta: a measure of how a stock's movement correlates to the movement of the entire stock market. The beta is not the same as volatility. *See also* Standard Deviation, Volatility.

Black Model: a model used to predict futures option prices; it is a modified version of the Black–Scholes model. *See* Model.

Board Broker: the exchange member in charge of keeping the book of public orders on exchanges utilizing the "market-maker" system, as opposed to the "specialist system," of executing orders. *See also* Market-Maker, Specialist.

Box Spread: a type of option arbitrage in which both a bull spread and a bear spread are established for a riskless profit. One spread is established using put options and the other is established using calls. The spreads may both be debit spreads (call bull spread vs. put bear spread), or both credit spreads (call bear spread vs. put bull spread).

Break-Even Point: the stock price (or prices) at which a particular strategy neither makes nor loses money. It generally pertains to the result at the expiration date of the options involved in the strategy. A "dynamic" break-even point is one that changes as time passes.

Broad-Based: generally referring to an index, it indicates that the index is composed of a sufficient number of stocks or of stocks in a variety of industry groups. Broad-based indices are subject to more favorable treatment for naked option writers. *See also* Narrow-Based.

Bull Spread: an option strategy that achieves its maximum potential if the underlying security rises far enough, and has its maximum risk if the security falls far enough. An option with a lower striking price is bought and one with a higher striking price is sold, both generally having the same expiration date. Either puts or calls may be used for the strategy. *See also* Bear Spread.

Bullish: describing an opinion or outlook in which one expects a rise in price, either by the general market or by an individual security. *See also* Bearish.

Butterfly Spread: an option strategy that has both limited risk and limited profit potential, constructed by combining a bull spread and a bear spread. Three striking prices are involved, with the lower two being utilized in the bull spread and the higher two in the bear spread. The strategy can be established with either puts or calls; there are four different ways of combining options to construct the same basic position.

Calendar Spread: an option strategy in which a short-term option is sold and a longer-term option is bought, both having the same striking price. Either puts or

calls may be used. A calendar combination is a strategy that consists of a call calendar spread and a put calendar spread at the same time. The striking prices of the calls would be higher than the striking prices of the puts. A calendar straddle consists of selling a near-term straddle and buying a longer-term straddle, both with the same striking price.

Calendar Straddle or Combination: *see* Calendar spread.

Call: an option that gives the holder the right to buy the underlying security at a specified price for a certain, fixed period of time. *See also* Put.

Call Price: the price at which a bond or preferred stock may be called in by the issuing corporation; *see* Redemption Price.

Capitalization-Weighted Index: a stock index that is computed by adding the capitalizations (float times price) of each individual stock in the index, and then dividing by the divisor. The stocks with the largest market values have the heaviest weighting in the index. *See also* Divisor, Float, Price-Weighted Index.

Carrying Cost: the interest expense on a debit balance created by establishing a position.

Cash-Based: Referring to an option or future that is settled in cash when exercised or assigned. No physical entity, either stock or commodity, is received or delivered.

CBOE: the Chicago Board Options Exchange; the first national exchange to trade listed stock options.

Circuit Breaker: a limit applied to the trading of index futures contracts designed to keep the stock market from crashing.

Class: a term used to refer to all put and call contracts on the same underlying security.

Closing Transaction: a trade that reduces an investor's position. Closing buy transactions reduce short positions and closing sell transactions reduce long positions. *See also* Opening Transaction.

Collateral: the loan value of marginable securities; generally used to finance the writing of uncovered options.

Combination: (1) any position involving both put and call options that is not a straddle. *See also* Straddle. (2) the name given to the trade at expiration whereby an arbitrageur rolls his options from one month to the next. For example, if he sells his synthetic long stock position in June and reestablishes it by buying a synthetic long stock position in September, the entire four-sided trade is called a combination by floor traders. *See also* Straddle, Strangle.

Commodities: *see* Futures Contract.

Contingent Order: an order whose execution or price is dependent on the alignment or price of the underlying security and/or its options. Most commonly it is an order to buy stock and sell a covered call option that is given as one order to the trading desk of a brokerage firm. Also called a "net order." This is a "not held" order. *See also* Market Not Held Order.

Conversion Arbitrage: a riskless transaction in which the arbitrageur buys the underlying security, buys a put, and sells a call. The options have the same terms. *See also* Reversal Arbitrage.

Conversion Ratio: *see* Convertible Security.

Converted Put: *see* Synthetic Put.

Convertible Security: a security that is convertible into another security. Generally, a convertible bond or convertible preferred stock is convertible into the underlying stock of the same corporation. The rate at which the shares of the bond or preferred stock are convertible into the common is called the conversion ratio.

Cover: to buy back as a closing transaction an option that was initially written, or stock that was initially sold short.

Covered: a written option is considered to be covered if the writer also has an opposing market position on a share-for-share basis in the underlying security. That is, a short call is covered if the underlying stock is owned, and a short put is covered (for margin purposes) if the underlying stock is also short in the account. In addition, a short call is covered if the account is also long another call on the same security, with a striking price equal to or less than the striking price of the short call. A short put is covered if there is also a long put in the account with a striking price equal to or greater than the striking price of the short put.

Covered Call Write: a strategy in which one writes call options while simultaneously owning an equal number of shares of the underlying stock.

Covered Put Write: a strategy in which one sells put options and simultaneously is short an equal number of shares of the underlying security.

Covered Straddle Write: the term used to describe the strategy in which an investor owns the underlying security and also writes a straddle on that security. This is not really a covered position.

Credit: money received in an account. A credit transaction is one in which the net sale proceeds are larger than the net buy proceeds (cost), thereby bringing money into the account. *See also* Debit.

Cycle: the expiration dates applicable to various classes of options. There are three cycles: January/April/July/October, February/May/ August/November, and March/June/September/December.

Debit: an expense, or money paid out from an account. A debit transaction is one in which the net cost is greater than the net sale proceeds. *See also* Credit.

Deliver: to take securities from an individual or firm and transfer them to another individual or firm. A call writer who is assigned must deliver stock to the call holder who exercised. A put holder who exercises must deliver stock to the put writer who is assigned.

Delivery: the process of satisfying an equity call assignment or an equity put exercise. In either case, stock is delivered. For futures, the process of transferring the physical commodity from the seller of the futures contract to the buyer. Equivalent delivery refers to a situation in which delivery may be made in any of various, similar entities that are equivalent to each other (for example, Treasury bonds with differing coupon rates).

Delta: (1) the amount by which an option's price will change for a corresponding 1-point change in price by the underlying entity. Call options have positive deltas, while put options have negative deltas. Technically, the delta is an instantaneous measure of the option's price change, so that the delta will be altered for even fractional changes by the underlying entity. Consequently, the terms "up delta" and "down delta" may be applicable. They describe the option's change after a full 1-point change in price by the underlying security, either up or down. The "up delta" may bé larger than the "down delta" for a call option, while the reverse is true for put options. (2) the percent probability of a call being in-the-money at expiration. *See also* Hedge Ratio.

Delta Neutral Spread: a ratio spread that is established as a neutral position by utilizing the deltas of the options involved. The neutral ratio is determined by dividing the delta of the purchased option by the delta of the written option. *See also* Delta, Ratio Spread.

Depository Trust Corporation (DTC): a corporation that will hold securities for member institutions. Generally used by option writers, the DTC facilitates and guarantees delivery of underlying securities when assignment is made against securities held in DTC.

Diagonal Spread: any spread in which the purchased options have a longer maturity than do the written options, as well as having different striking prices. Typical

types of diagonal spreads are diagonal bull spreads, diagonal bear spreads, and diagonal butterfly spreads.

Discount: an option is trading at a discount if it is trading for less than its intrinsic value. A future is trading at a discount if it is trading at a price less than the cash price of its underlying index or commodity. *See also* Intrinsic Value, Parity.

Discount Arbitrage: a riskless arbitrage in which a discount option is purchased and an opposite position is taken in the underlying security. The arbitrageur may either buy a call at a discount and simultaneously sell the underlying security (basic call arbitrage), or buy a put at a discount and simultaneously buy the underlying security (basic put arbitrage). *See also* Discount.

Discretion: *see* Limit Order, Market Not Held Order.

Dividend Arbitrage: in the riskless sense, an arbitrage in which a put is purchased and so is the underlying stock. The put is purchased when it has time value premium less than the impending dividend payment by the underlying stock. The transaction is closed after the stock goes ex-dividend. Also used to denote a form of risk arbitrage in which a similar procedure is followed, except that the amount of the impending dividend is unknown and therefore risk is involved in the transaction. *See also* Ex-Dividend, Time Value Premium.

Divisor: a mathematical quantity used to compute an index. It is initially an arbitrary number that reduces the index value to a small, workable number. Thereafter the divisor is adjusted for stock splits (price-weighted index) or additional issues of stock (capitalization-weighted index).

Downside Protection: generally used in connection with covered call writing, this is the cushion against loss, in case of a price decline by the underlying security, that is afforded by the written call option. Alternatively, it may be expressed in terms of the distance the stock could fall before the total position becomes a loss (an amount equal to the option premium), or it can be expressed as percentage of the current stock price. *See also* Covered Call Write.

Dynamic: for option strategies, describing analyses made during the course of changing security prices and during the passage of time. This is as opposed to an analysis made at expiration of the options used in the strategy. A dynamic break-even point is one that changes as time passes. A dynamic follow-up action is one that will change as either the security price changes or the option price changes or time passes. *See also* Break-Even Point, Follow-Up Action.

Early Exercise (assignment): the exercise or assignment of an option contract before its expiration date.

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Equity Option: an option that has common stock as its underlying security. *See also* Non-Equity Option.

Equity Requirement: a requirement that a minimum amount of equity must be present in a margin account. Normally, this requirement is $2,000, but some brokerage firms may impose higher equity requirements for uncovered option writing.

Equivalent Positions: positions that have similar profit potential, when measured in dollars, but are constructed with differing securities. Equivalent positions have the same profit graph. A covered call write is equivalent to an uncovered put write, for example. *See also* Profit Graph.

Escrow Receipt: a receipt issued by a bank in order to verify that a customer (who has written a call) in fact owns the stock and therefore the call is considered covered.

European Exercise: a feature of an option that stipulates that the option may be exercised only at its expiration. Therefore, there can be no early assignment with this type of option.

Exchange-Traded Fund (ETF): an index fund that is listed on a stock exchange. Options are listed on some ETFs. *See also* Index Fund.

Ex-Dividend: the process whereby a stock's price is reduced when a dividend is paid. The ex-dividend date (ex-date) is the date on which the price reduction takes place. Investors who own stock on the ex-date will receive the dividend, and those who are short stock must pay out the dividend.

Exercise: to invoke the right granted under the terms of a listed options contract. The holder is the one who exercises. Call holders exercise to buy the underlying security, while put holders exercise to sell the underlying security.

Exercise Limit: the limit on the number of contracts a holder can exercise in a fixed period of time. Set by the appropriate option exchange, it is designed to prevent an investor or group of investors from "cornering" the market in a stock.

Exercise Price: the price at which the option holder may buy or sell the underlying security, as defined in the terms of his option contract. It is the price at which the call holder may exercise to buy the underlying security or the put holder may exercise to sell the underlying security. For listed options, the exercise price is the same as the striking price. *See also* Exercise.

Expected Return: a rather complex mathematical analysis involving statistical distribution of stock prices, it is the return an investor might expect to make on an investment if he were to make exactly the same investment many times throughout history.

Expiration Date: the day on which an option contract becomes void. The expiration date for listed stock options is the Saturday after the third Friday of the expiration month. All holders of options must indicate their desire to exercise, if they wish to do so, by this date. *See also* Expiration Time.

Expiration Time: the time of day by which all exercise notices must be received on the expiration date. Technically, the expiration time is currently 5:00 P.M. on the expiration date, but public holders of option contracts must indicate their desire to exercise no later than 5:30 P.M. on the business day preceding the expiration date. The times are Eastern Time. *See also* Expiration Date.

Facilitation: the process of providing a market for a security. Normally, this refers to bids and offers made for large blocks of securities, such as those traded by institutions. Listed options may be used to offset part of the risk assumed by the trader who is facilitating the large block order. *See also* Hedge Ratio.

Fair Value: normally, a term used to describe the worth of an option or futures contract as determined by a mathematical model. Also sometimes used to indicate intrinsic value. *See also* Intrinsic Value, Model.

First Notice Day: the first day upon which the buyer of a futures contract can be called upon to take delivery. *See also* Notice Period.

Float: the number of shares outstanding of a particular common stock.

Floor Broker: a trader on the exchange floor who executes the orders of public customers or other investors who do not have physical access to the trading area.

Follow-Up Action: any trading in an option position after the position is established. Generally, to limit losses or to take profits.

Fundamental Analysis: a method of analyzing the prospects of a security by observing accepted accounting measures such as earnings, sales, assets, and so on. *See also* Technical Analysis.

Futures Contract: a standardized contract calling for the delivery of a specified quantity of a commodity at a specified date in the future.

Gamma: a measure of risk of an option that measures the amount by which the delta changes for a 1-point change in the stock price; alternatively, when referring to an entire option position, the amount of change of the delta of the entire position when the stock changes in price by one point.

Gamma of the Gamma: a mathematical measure of risk that measures by how much the gamma will change for a 1-point move in the stock price. *See* Gamma.

Good Until Canceled (GTC): a designation applied to some types of orders, meaning that the order remains in effect until it is either filled or canceled. *See also* Limit, Stop-Limit Order, Stop Order.

Hedge Ratio: the mathematical quantity that is equal to the delta of an option. It is useful in facilitation in that a theoretically riskless hedge can be established by taking offsetting positions in the underlying stock and its call options. *See also* Delta, Facilitation.

Historic Volatility: *See* Volatility.

Holder: the owner of a security.

Horizontal Spread: an option strategy in which the options have the same striking price, but different expiration dates.

Implied Volatility: a prediction of the volatility of the underlying stock, it is determined by using prices currently existing in the option market at the time, rather than using historical data on the price changes of the underlying stock. *See also* Volatility.

Incremental Return Concept: a strategy of covered call writing in which the investor is striving to earn an additional return from option writing against a stock position that he is targeted to sell, possibly at substantially higher prices.

Index: a compilation of the prices of several common entities into a single number. *See also* Capitalization-Weighted Index, Price-Weighted Index.

Index Arbitrage: a form of arbitraging index futures against stock. If futures are trading at prices significantly higher than fair value, the arbitrager sells futures and buys the exact stocks that make up the index being arbitraged; if futures are at a discount to fair value, the arbitrage entails buying futures and selling stocks.

Index Fund: a mutual fund whose components exactly match the stocks that make up a widely disseminated index, such as the S&P 500, Dow-Jones, Russell 2000, or NASDAQ-100. *See also* Exchange-Traded Fund.

Index Option: an option whose underlying entity is an index. Most index options are cash-based.

Institution: an organization, probably very large, engaged in investing in securities. Normally a bank, insurance company, or mutual fund.

Intermarket Spread: a futures spread in which futures contracts in one market are spread against futures contracts trading in another market. Examples: Currency spreads (yen vs. deutsche mark) or TED spread (T-Bills vs. Eurodollars).

In-the-Money: a term describing any option that has intrinsic value. A call option is in-the-money if the underlying security is higher than the striking price of the call. A put option is in-the-money if the security is below the striking price. *See also* Intrinsic Value, Out-of-the-Money.

Intramarket Spread: a futures spread in which futures contracts are spread against other futures contracts in the same market; example, buy May soybeans, sell March soybeans.

Intrinsic Value: the value of an option if it were to expire immediately with the underlying stock at its current price; the amount by which an option is in-the-money. For call options, this is the difference between the stock price and the striking price, if that difference is a positive number, or zero otherwise. For put options it is the difference between the striking price and the stock price, if that difference is positive, and zero otherwise. *See also* In-the-Money, Parity, Time Value Premium.

Last Trading Day: the third Friday of the expiration month. Options cease trading at 3:00 P.M. Eastern Time on the last trading day.

LEAPS: Long-term Equity Anticipation Securities. These are long-term listed options, currently having maturities as long as two and one-half years.

Leg: a risk-oriented method of establishing a two-sided position. Rather than entering into a simultaneous transaction to establish the position (a spread, for example), the trader first executes one side of the position, hoping to execute the other side at a later time and a better price. The risk materializes from the fact that a better price may never be available, and a worse price must eventually be accepted.

Letter of Guarantee: a letter from a bank to a brokerage firm stating that a customer (who has written a call option) does indeed own the underlying stock and the bank will guarantee delivery if the call is assigned. Thus, the call can be considered covered. Not all brokerage firms accept letters of guarantee.

Leverage: in investments, the attainment of greater percentage profit and risk potential. A call holder has leverage with respect to a stockholder—the former will have greater percentage profits and losses than the latter, for the same movement in the underlying stock.

Limit: *see* Trading Limit.

Limit Order: an order to buy or sell securities at a specified price (the limit). A limit order may also be placed "with discretion"—a fixed; usually small, amount such as $1/8$ or $1/4$ of a point. In this case, the floor broker executing the order may use his

discretion to buy or sell at 1/8 or 1/4 of a point beyond the limit if he feels it is necessary to fill the order.

Listed Option: a put or call option that is traded on a national option exchange. Listed options have fixed striking prices and expiration dates. *See also* Over-the-Counter Option.

Local: a trader on a futures exchange who buys and sells for his own account and may fill public orders.

Lognormal Distribution: a statistical distribution that is often applied to the movement of the stock prices. It is a convenient and logical distribution because it implies that stock prices can theoretically rise forever but cannot fall below zero—a fact which is, of course, true.

Margin: to buy a security by borrowing funds from a brokerage house. The margin requirement—the maximum percentage of the investment that can be loaned by the broker firm—is set by the Federal Reserve Board.

Market Basket: a portfolio of common stocks whose performance is intended to simulate the performance of a specific index. *See* Index.

Market-Maker: an exchange member whose function is to aid in the making of a market, by making bids and offers for his account in the absence of public buy or sell orders. Several market-makers are normally assigned to a particular security. The market-maker system encompasses the market-makers and the board brokers. *See also* Board Broker, Specialist.

Market Not Held Order: also a market order, but the investor is allowing the floor broker who is executing the order to use his own discretion as to the exact timing of the execution. If the floor broker expects a decline in price and he is holding a "market not held" buy order, he may wait to buy, figuring that a better price will soon be available. There is no guarantee that a "market not held" order will be filled.

Market Order: an order to buy or sell securities at the current market. The order will be filled as long as there is a market for the security.

Married Put and Stock: a put and stock are considered to be married if they are bought on the same day, and the position is designated at that time as a hedge.

Model: a mathematical formula designed to price an option as a function of certain variables—generally stock price, striking price, volatility, time to expiration, dividends to be paid, and the current risk-free interest rate. The Black–Scholes model is one of the more widely used models.

Monte Carlo Simulation: a model designed to simulate a real-world event that cannot be approximated merely with a mathematical formula. The Monte Carlo simulation approximates such an event (the movement of the stock market, for example) and then it is simulated a great number of times. The net result of all the simulations is then interpreted as the result, generally expressed as a probability of occurrence. For example, a Monte Carlo simulation can be used to determine how stocks might behave under certain stock price distributions that are different from the lognormal distribution.

Naked Option: see Uncovered Option.

Narrow-Based: Generally referring to an index, it indicates that the index is composed of only a few stocks, generally in a specific industry group. Narrow-based indices are not subject to favorable treatment for naked option writers. *See also* Broad-Based.

"Net" Order: *see* Contingent Order.

Neutral: describing an opinion that is neither bearish or bullish. Neutral option strategies are generally designed to perform best if there is little nor no net change in the price of the underlying stock. *See also* Bearish, Bullish.

Non-Equity Option: an option whose underlying entity is not common stock; typically refers to options on physical commodities, but may also be extended to include index options.

"Not Held": *see* Market Not Held Order.

Notice Period: the time during which the buyer of a futures contract can be called upon to accept delivery. Typically, the 3 to 6 weeks preceding the expiration of the contract.

Open Interest: the net total of outstanding open contracts in a particular option series. An opening transaction increases the open interest, while any closing transaction reduces the open interest.

Opening Transaction: a trade that adds to the net position of an investor. An opening buy transaction adds more long securities to the account. An opening sell transaction adds more short securities. *See also* Closing Transaction.

Option Pricing Curve: a graphical representation of the projected price of an option at a fixed point in time. It reflects the amount of time value premium in the option for various stock prices, as well. The curve is generated by using a mathematical model. The delta (or hedge ratio) is the slope of a tangent line to the curve at a fixed stock price. *See also* Delta, Hedge Ratio, Model.

Options Clearing Corporation (OCC): the issuer of all listed option contracts that are trading on the national option exchanges.

Original Issue Discount (OID): the initial price of a zero-coupon bond. The owner owes taxes on the theoretical interest, or phantom income, generated by the annual appreciation of the bond toward maturity. In reality, no interest is paid by the zero-coupon bond, but the government is taxing the appreciation of the bond as if it were interest.

Out-of-the-Money: describing an option that has no intrinsic value. A call option is out-of-the-money if the stock is below the striking price of the call, while a put option is out-of-the-money if the stock is higher than the striking price of the put. *See also* In-the-Money, Intrinsic Value.

Over-the-Counter Option (OTC): an option traded over-the-counter, as opposed to a listed stock option. The OTC option has a direct link between buyer and seller, has no secondary market, and has no standardization of striking prices and expiration dates. *See also* Listed Option, Secondary Market.

Overvalued: describing a security trading at a higher price than it logically should. Normally associated with the results of option price predictions by mathematical models. If an option is trading in the market for a higher price than the model indicates, the option is said to be overvalued. *See also* Fair Value, Undervalued.

Pairs Trading: a hedging technique in which one buys a particular stock and sells short another stock. The two stocks are theoretically linked in their price history, and the hedge is established when the historical relationship is out of line, in hopes that it will return to its former correlation.

Parity: describing an in-the-money option trading for its intrinsic value: that is, an option trading at parity with the underlying stock. Also used as a point of reference—an option is sometimes said to be trading at a half-point over parity or at a quarter-point under parity, for example. An option trading under parity is a discount option. *See also* Discount, Intrinsic Value.

PERCS: Preferred Equity Redemption Cumulative Stock. Issued by a corporation, this preferred stock pays a higher dividend than the common and has a price at which it can be called in for redemption by the issuing corporation. As such, it is really a covered call write, with the call premium being given to the holder in the form of increased dividends. *See* Call Price, Covered Call Write, Redemption Price.

Physical Option: an option whose underlying security is a physical commodity that is not stock or futures. The physical commodity itself, typically a currency or

Treasury debt issue, underlies that option contract. *See also* Equity Option, Index Option.

Portfolio Insurance: a method of selling index futures or buying index put options to protect a portfolio of stocks.

Position: as a noun, specific securities in an account or strategy. A covered call writing position might be long 1,000 XYZ and short 10 XYZ January 30 calls. As a verb, to facilitate; to buy or sell—generally a block of securities—thereby establishing a position. *See also* Facilitation, Strategy.

Position Limit: the maximum number of put or call contracts on the same side of the market that can be held in any one account or group of related accounts. Short puts and long calls are on the same side of the market. Short calls and long puts are on the same side of the market.

Premium: for options, the total price of an option contract. The sum of the intrinsic value and the time value premium. For futures, the difference between the futures price and the cash price of the underlying index or commodity.

Present Worth: a mathematical computation that determines how much money would have to be invested today, at a specified rate, in order to produce a designated amount at some time in the future. For example, at 10% for one year, the present worth of $110 is $100.

Price-Weighted Index: a stock index that is computed by adding the prices of each stock in the index, and then dividing by the divisor. *See also* Capitalization-Weighted Index, Divisor.

Profit Graph: a graphical representation of the potential outcomes of a strategy. Dollars of profit or loss are graphed on the vertical axis, and various stock prices are graphed on the horizontal axis. Results may be depicted at any point in time, although the graph usually depicts the results at expiration of the options involved in the strategy.

Profit Range: the range within which a particular position makes a profit. Generally used in reference to strategies that have two break-even points—an upside break-even and a downside break-even. The price range between the two break-even points would be the profit range. *See also* Break-Even Point.

Profit Table: a table of results of a particular strategy at some point in time. This is usually a tabular compilation of the data drawn on a profit graph. *See also* Profit Graph.

Program Trading: the act of buying or selling a particular portfolio of stocks and hedging with an offsetting position in index futures. The portfolio of stocks may be small or large, but it is not the makeup of any stock index. *See also* Index Arbitrage.

Protected Strategy: a position that has limited risk. A protected short sale (short stock, long call) has limited risk, as does a protected straddle write (short straddle, long out-of-the-money combination). *See also* Combination, Straddle.

Public Book (of orders): the orders to buy or sell, entered by the public, that are away from the current market. The board broker or specialist keeps the public book. Market-makers on the CBOE can see the highest bid and lowest offer at any time. The specialist's book is closed (only he knows at what price and in what quantity the nearest public orders are). *See also* Board Broker, Market-Maker, Specialist.

Put: an option granting the holder the right to sell the underlying security at a certain price for a specified period of time. *See also* Call.

Put-Call Ratio: the ratio of put trading volume divided by call trading volume; sometimes calculated with open interest or total dollars instead of trading volume. Can be calculated daily, weekly, monthly, etc. Moving averages are often used to smooth out short-term, daily figures.

Ratio Calendar Combination: a strategy consisting of a simultaneous position of a ratio calendar spread using calls and a similar position using puts, where the striking price of the calls is greater than the striking price of the puts.

Ratio Calendar Spread: selling more near-term options than longer-term ones purchased, all with the same strike, either puts or calls.

Ratio Spread: constructed with either puts or calls, the strategy consists of buying a certain amount of options and then selling a larger quantity of out-of-the-money options.

Ratio Strategy: a strategy in which one has an unequal number of long securities and short securities. Normally, it implies a preponderance of short options over either long options or long stock.

Ratio Write: buying stock and selling a preponderance of calls against the stock that is owned. (Occasionally constructed as shorting stock and selling puts.)

Redemption Price: the price at which a structured product may be redeemed for cash. This is distinctly different from a "call price," which is the price at which an issue may be called away by the issuer. *See also* Call Price, PERCS, Structured Product.

Resistance: a term in technical analysis indicating a price area higher than the current stock price where an abundance of supply exists for the stock, and therefore the stock may have trouble rising through the price. *See also* Support.

Return (on investment): the percentage profit that one makes, or might make, on his investment.

Return if Exercised: the return that a covered call writer would make if the underlying stock were called away.

Return if Unchanged: the return that an investor would make on a particular position if the underlying stock were unchanged in price at the expiration of the options in the position.

Reversal Arbitrage: a riskless arbitrage that involves selling the stock short, writing a put, and buying a call. The options have the same terms. *See also* Conversion Arbitrage.

Reverse Hedge: a strategy in which one sells the underlying stock short and buys calls on more shares than he has sold short. This is also called a synthetic straddle and is an outmoded strategy for stocks that have listed puts trading. *See also* Ratio Write, Straddle.

Reverse Strategy: a general name that is given to strategies that are the opposite of better-known strategies. For example, a ratio spread consists of buying calls at a lower strike and selling more calls at a higher strike. A reverse ratio spread, also known as a backspread, consists of selling the calls at the lower strike and buying more calls at the higher strike. The results are obviously directly opposite to each other. *See also* Reverse Hedge Ratio Write, Reverse Hedge.

Rho: the measure of how much an option changes in price for an incremental move (generally 1%) in short-term interest rates; more significant for longer-term or in-the-money options.

Risk Arbitrage: a form of arbitrage that has some risk associated with it. Commonly refers to potential takeover situations in which the arbitrageur buys the stock of the company about to be taken over and sells the stock of the company that is effecting the takeover. *See also* Dividend Arbitrage.

Roll: a follow-up action in which the strategist closes options currently in the position and opens other options with different terms, on the same underlying stock. *See also* Roll Down, Roll Forward, and Roll Up.

Roll Down: close out options at one strike and simultaneously open other options at a lower strike.

Roll Forward: close out options at a near-term expiration date and open options at a longer-term expiration date.

Roll Up: close out options at a lower strike and open options at a higher strike.

Rotation: a trading procedure on the open exchanges whereby bids and offers, but not necessarily trades, are made sequentially for each series of options on an underlying stock or index.

Secondary Market: any market in which securities can be readily bought and sold after their initial issuance. The national listed option exchanges provided, for the first time, a secondary market in stock options.

Serial Option: a futures option for which there is no corresponding futures contract expiring in the same month. The underlying futures contract is the next futures contract out in time. Example: There is no March gold futures contract, but there is an April gold futures contract, so March gold options, which are serial options, are options on April gold futures.

Series: all option contracts on the same underlying stock having the same striking price, expiration date, and unit of trading.

Skew: *See* Volatility Skew.

Specialist: an exchange member whose function it is both to make markets—buy and sell for his own account in the absence of public orders—and to keep the book of public orders. Most stock exchanges and some option exchanges utilize the specialist system of trading

Spread Order: an order to simultaneously transact two or more option trades. Typically, one option would be bought while another would simultaneously be sold. Spread orders may be limit orders, not held orders, or orders with discretion. They cannot be stop orders, however. The spread order may be either a debit or a credit.

Spread Strategy: any option position having both long options and short options of the same type on the same underlying security.

Standard Deviation: a measure of the volatility of a stock. It is a statistical quantity measuring the magnitude of the daily price changes of that stock. *See* also, Volatility.

Stop Order: an order, placed away from the current market, that becomes a market order if the security trades at the price specified on the stop order. Buy stop orders are placed above the market, while sell stop orders are placed below.

Stop-Limit Order: similar to a stop order, the stop-limit order becomes a limit order, rather than a market order, when the security trades at the price specified on the stop. *See also* Stop Order.

Straddle: the purchase or sale of an equal number of puts and calls having the same terms.

Strangle: a combination involving a put and a call at different strikes with the same expiration date.

Strategy: with respect to option investments, a preconceived, logical plan of position selection and follow-up action.

Striking Price: *see* Exercise Price.

Striking Price Interval: the distance between striking prices on a particular underlying security. For stocks, the interval is normally 2.5 points for lower-priced stocks and 5 points for higher-priced stocks. For indices, the interval is either 5 or 10 points. For futures, the interval is often as low as one or two points.

Structured Product: a combination of securities and possibly options into a single security that behaves like stock and trades on a listed stock exchange. Structured products are created by many of the largest financial institutions (banks and brokerage firms). Many of the more popular ones are known by their acronyms, created by the institutions that issued them: MITTS, TARGETS, BRIDGES, LINKS, DINKS, ELKS, and PERCS. *See also* PERCS.

Subindex: *see* Narrow-Based.

Suitable: describing a strategy or trading philosophy in which the investor is operating in accordance with his financial means and investment objectives.

Support: a term in technical analysis indicating a price area lower than the current price of the stock, where demand is thought to exist. Thus, a stock would stop declining when it reached a support area. *See also* Resistance.

Synthetic Put: a strategy constructed by shorting the underlying instrument and buying a call. The resulting position has the same profit and loss characteristics as a long put option.

Synthetic Stock: an option strategy that is equivalent to the underlying stock. A long call and a short put is synthetic long stock. A long put and a short call is synthetic short stock.

Technical Analysis: the method of predicting future stock price movements based on observation of historical stock price movements.

Terms: the collective name denoting the expiration date, striking price, and underlying stock of an option contract.

Theoretical Value: the price of an option, or a spread, as computed by a mathematical model.

Theta: the measure of how much an option's price decays for each day of time that passes.

Time Spread: *see* Calendar Spread.

Time Value Premium: the amount by which an option's total premium exceeds its intrinsic value.

Total Return Concept: a covered call writing strategy in which one views the potential profit of the strategy as the sum of capital gains, dividends, and option premium income, rather than viewing each one of the three separately.

Tracking Error: the amount of difference between the performance of a specific portfolio of stocks and a broad-based index with which they are being compared. *See* Market Basket.

Trader: a speculative investor or professional who makes frequent purchases and sales.

Trading Limit: the exchange-imposed maximum daily price change that a futures contract or futures option contract can undergo.

Treasury Bill/Option Strategy: a method of investment in which one places approximately 90% of his funds in risk-free, interest-bearing assets such as Treasury bills, and buys options with the remainder of his assets.

Type: the designation to distinguish between a put or call option.

Uncovered Option: a written option is considered to be uncovered if the investor does not have a corresponding position in the underlying security. *See also* Covered.

Underlying Security: the security that one has the right to buy or sell via the terms of a listed option contract.

Undervalued: describing a security that is trading at a lower price than it logically should. Usually determined by the use of a mathematical model. *See also* Fair Value, Overvalued.

Variable Ratio Write: an option strategy in which the investor owns 100 shares of the underlying security and writes two call options against it, each option having a different striking price.

Vega: the measure of how much an option's price changes for an incremental change—usually one percentage point—in volatility.

Vertical Spread: any option spread strategy in which the options have different striking prices but the same expiration dates.

Volatility: a measure of the amount by which an underlying security is expected to fluctuate in a given period of time. Generally measured by the annual standard deviation of the daily price changes in the security, volatility is not equal to the beta of the stock. Also called historical volatility, statistical volatility, or actual volatility. *See also* Implied Volatility.

Volatility Skew: the term used to describe a phenomenon in which individual options on a single underlying instrument have different implied volatilities. In general, not only are the individual options' implied volatilities different, but they form a pattern. If the lower striking prices have the lowest implied volatilities, and then implied volatility progresses higher as one moves up through the striking prices, that is called a forward or positive skew. A reverse or negative skew works in the opposite way: The higher strikes have the lowest implied volatilities.

Warrant: a long-term, nonstandardized security that is much like an option. Warrants on stocks allow one to buy (usually one share of) the common at a certain price until a certain date. Index warrants are generally warrants on the price of foreign indices. Warrants have also been listed on other things such as cross-currency spreads and the future price of a barrel of oil.

Write: to sell an option. The investor who sells is called the writer.

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